FINAL DESIGN REPORT
FOR
WATER QUALITY BASIN
AT WOODSIDE AVENUE

Job Number 14804-B
December 10, 2004
Revised: December 30, 2004
Revised: March 23, 2005
Revised: April 20, 2005

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FINAL DESIGN REPORT

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Job Number 14804-B

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FINAL DESIGN REPORT
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REVISION PAGE

April 20, 2005

This study presents a revision (and supersedes) the previous report with the following title and date:

"Final Design Report for Water Quality Basin at Woodside Avenue,"
with a revised date of March 23, 2005

This revision has been prepared to finalize this report based on the Final Grading Plans that were completed March 23, 2005. A draft version of the final report was prepared and dated March 23, 2005; however, final revisions were expected and are addressed within this final version.

FINAL DESIGN REPORT
FOR
WATER QUALITY BASIN AT WOODSIDE AVENUE

REVISION PAGE

March 23, 2005

This study presents a revision (and supersedes) the previous report with the following title and date:

"Preliminary Design for Water Quality Basin at Woodside Avenue,"
with a revised date of December 29, 2004

This revision has been prepared in order to address final design changes that occurred through the 50-percent and 100-percent plan preparation. Comments for the final report were received from the County on January 26, 2005, and they have also been addressed within this report. One important change that has occurred is that since the final design report was prepared, a field survey was performed by Rick Engineering Company (in February 2005), that provided a difference in existing elevations than those previously assumed from the available topography. As a result of those changes, the vertical constraints were tightened, and the final volumes contained within the basin have been reduced.

Refer to the enclosed report for all final engineering analyses, design data, and assumptions.

FINAL DESIGN
FOR
WATER QUALITY BASIN AT WOODSIDE AVENUE

REVISION PAGE

December 30, 2004

This study presents a revision (and supersedes) the previous report dated December 10, 2004 with the same title.

This revision has been prepared in order to provide Appendices D and E, which were intentionally left blank at the time of the December 10, 2004 report submittal to the County of San Diego.

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The County of San Diego Department of Public Works has received a grant agreement from the State Water Resources Control Board (State of California) that is identified as Agreement No. 04-067-559-0. The grant agreement calls for the design and construction of a water quality control basin and the removal of arundo on a vacant property. As a result of the grant agreement, this report has been prepared to summarize and provide the back-up data regarding hydraulics, hydrology, existing facility data, design criteria, specific design requirements, design constraints, assumptions, quantity and cost estimate support, and all engineering calculations and analyses in regards to the water quality control basin.

1.2 PROJECT LOCATION

The 1.7-acre project site is located on a vacant property upstream of Woodside Avenue in the Vicinity of Winter Gardens. The vacant property is East of Riverview Avenue and West of Winter Gardens Boulevard, APN 38207106.

A Vicinity Map for the project location has been provided as Appendix A. A copy of the basin layout is also shown in Appendix H of this report, and copies of Plan Sheets 2 through 5 are included for reference in Map Pocket 1 (these sheets depict specific details, project constraints, and the plan view).

1.3 TOPOGRAPHY AND LAND USE

The project area is characterized by mostly flat slopes, with what appears to be a large mound of fill that has been previously placed on-site. The property is vacant, covered by a mixture of barren (earthen) soils and some light vegetative cover (grasses). There are no buildings on-site, however, the two adjacent properties to the east and west are developed. A residential complex is located to the east, while an older industrial building and two residential lots are located to the west. It appears that most of the upstream tributary drainage area is comprised of urbanized land, with a high quantity of impervious areas and development. The County of San Diego provided the topography that was used during the preliminary design, and additional field survey data (by Rick Engineering Company) has been used to supplement the topography during final design of the basin.

1.4 DRAINAGE CHARACTERISTICS

A large concrete channel conveys the majority of storm water runoff into the project site at the southeast corner. According to the "Channel Plans for: Riverview Farms Drainage Project," dated February 2, 1984, the size of the off-site channel is of the following dimensions: b=18.0', h=8.0', z=0. At the end of the large concrete channel, runoff is conveyed through a 40-foot riprap pad (per the plans – however, no longer visible) and transitions into an existing concrete (cobble) channel along the southern edge of the project site. The transition from the large off-site concrete channel to the smaller on-site concrete (cobble) channel is of the following approximate dimensions: b=7.0', h=6.0', z=2, n=.035 (as stated in the Flood Control Facilities Master Plan – Special Drainage Areas 5 and 6 for the County of San Diego - hereafter referred as the MDP, dated January 2004).

The existing concrete (cobble) channel conveys flow in a westerly direction along the southern edge of the project site until it turns 90-degrees to the north and flows along the western edge of the project site. At the northwest edge of the project site, the concrete (cobble) channel enters into an existing pair of 58-inch by 36-inch CMP culverts (via an existing headwall – below the existing sidewalk). The culverts (one oval, one squash) extend in a northwesterly direction under Woodside Avenue, and discharge into a 4'x6' Reinforced Concrete Box (RCB) culvert which immediately discharges into an open grass channel that runs westerly along the north edge of Woodside Ave. From there, storm water runoff flows through a series of existing underground storm drain pipe, open channels, and a triple box culvert (under Route 67) until runoff eventually discharges into Los Coches immediately upstream of its confluence with the San Diego River.
The project is intended to provide water quality treatment for the low flows passing through the project site. The water quality basin is not intended for flood control purposes, however, some

detention will occur that may help to reduce the magnitude of flooding occurrences. According to the MDP, the existing facilities located upstream of the site, through the site, and downstream of the site are all significantly undersized for the anticipated 100-year peak storm event. As a result, this project will not fix the potential flooding problems in the vicinity of the project, however, the basin will be designed in such a way as to prevent it from being worsened.

A copy of the AES Integrated Rational Method/UH Method computer program output that has been completed as part of the MDP has been provided in Appendix B for reference. Additionally, an 8.5" x 11" map is also included at the end of Appendix B that shows where the project site is in relation to the MDP drainage areas and node numbers. It is important to note that the latest MDP (available at the time of this report being finalized) provides two hydrologic calculations through the project site. The difference between the two separate analyses is that one incorporates a detention basin upstream that has not been built, while the other analysis does not incorporate the upstream detention basin. Based on conversations with the County of San Diego and the text of the MDP, it appears the detention basin that is modeled in the one analysis is considered a potential flood control-related project that may be designed/built in the future. However, at this time, it does not exist, and therefore will be ignored in the calculations for this water quality-related project.

The following portions of this report address the hydrology, water quality treatment, detention (hydrologic routing), hydraulics (i.e. spillways), and other design parameters in further detail.

2.0 HYDROLOGY

2.1 PRE-PROJECT HYDROLOGIC CHARACTERISTICS

The hydrologic characteristics for the project have been compiled from the Master Drainage Plan (MDP). This includes the 100-year peak storm event discharge rate, the tributary drainage area, and the time of concentration for flow entering the project site. The following table summarizes these values:

Table 2.1 - Summary of Pre-Project Hydrologic Characteristics for Water Quality Basin at Woodside Avenue

	At Upstream End of Basin (MDP Node 180266)	At Downstream End of Basin (MDP Node 180267)
100-Year Peak Runoff (Q_{100}), cfs:	1393	1404
Tributary Drainage Area (A), acres:	878	889
Time of Concentration (T_C), min:	19.9	20.2
Runoff Coefficient:	0.6 [1]	0.6 [1]

Note 1 - Not provided within the MDP, therefore an approximate value of C = 0.6 is used. This value was derived as a result of running the Rational Method Hydrograph program such that the program's output reflects the correct values for each of the known parameters from the modified rational method analysis (e.g. – the peak discharge 'Q', time of concentration 'T_c', 6-hour precipitation 'P_6', and drainage area 'A').

A copy of the AES Integrated Rational Method/UH Method computer program output has been provided in Appendix B of this report. The AES output that is included in Appendix B provides the back-up for the numbers listed in Table 2.1 above, and does not reflect an upstream detention basin that may be built in the future (as it is proposed in the MDP). The MDP also included a separate analysis that does include an upstream detention basin that may be built, however, that analysis has not been provided within this report since it does not apply to existing conditions.

3.0 WATER QUALITY TREATMENT

3.1 WATER QUALITY TREATMENT CHARACTERISTICS

The water quality treatment characteristics that are desired per the numerical sizing criteria, established within the County of San Diego SUSMP, has been determined to be unattainable for the type of BMP proposed for this project. The constraints of the project size, 1.7 acres, and the available depth (as measured from the top of existing berm to the existing invert out) do not provide the desirable water quality treatment volume. The available depth during preliminary design was approximately 5.7-feet maximum, per the available topography. The available depth determined during final design (following the field survey data collection) is approximately 4.9-feet maximum (measured from top of curb at edge of roadway - EL 384.1, to lowest 58"x36" CMP invert out – EL 379.2). The table below summarizes the water quality treatment flowrate and volume that would be required to meet the numerical sizing criteria (per the SUSMP), as well as the water quality treatment that is actually proposed for the project:

Table 3.1 - Summary of Water Quality Treatment Characteristics for Water Quality Basin at Woodside Avenue

	Desirable per SUSMP (numerical sizing criteria)	Provided by Project
Water Quality Treatment Flowrate (Q_T), cfs:	142 cfs	n/a - volume based BMP
Water Quality Treatment Volume (WQ_V), acre-ft:	37.3 ac-ft	3.6 ac-ft [1]

Note 1 - Volume is measured from basin bottom (EL 379.5) to the lowest invert of the basin spillway (EL 383.1) that conveys overflow towards the existing 58-inch by 36-inch CMP culverts. This volume is used to size the low-flow orifice, such that the basin will drain in a 48-72 hour time frame.

Copies of the numerical sizing criteria calculations and the final proposed volumes (as computed using the Pondpack Computer Program) have been provided in Appendix C of this report for reference.

3.2 WATER QUALITY BASIN METHODOLOGY AND CRITERIA

The water quality basin will be constructed to function as a Dry Extended Detention Basin. This type of BMP was desirable for many reasons. Some of the advantages of an extended detention basin are listed in the California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook – New Development and Redevelopment, January 2003. The advantages are as follows:

- They are relatively easy and inexpensive to construct and operate.
- They can provide substantial capture of sediment and the toxics fraction associated with particulates.
- They can help with controlling channel erosion and can be used to provide flood control by including additional flood detention storage.

3.2.1 Drawdown Time and Low-flow Outlet Structure

The design of the basin does not include any areas of permanent pools. This has been done to allow the basin to fully drain and to help in the prevention/reduction of vector control concerns. As stated in CASQA, the low-flow outlet structure will be sized to allow for complete drawdown of the water quality volume within 48-72 hours. According to CASQA, a check should also be made to ensure that "no more than 50% of the water quality volume should drain from the facility within the first 24 hours." Based on the final design for the basin, 50% of the water quality volume will drain in approximately 20 hours. In order to achieve the 24 hours, the total drawdown time would increase as well, nearing the threshold of 72-hours which was not desirable (based on conversations with the County).

An iterative procedure was used to determine what size would be required for the low-flow outlet structure to provide the desired drawdown time. The results of the final drawdown time calculation are summarized below:

Table 3.2.1 - Summary of Drawdown Time Calculation and Low-flow Outlet Structure

Diameter of Low-Flow Outlet Structure:	12-inch PVC, Steel Plated with 2" (wide) by 10" (high) vertical notch opening from flowline of outlet pipe, covered by a debris screen
Total Drawdown Time (T_{TOT}):	61.5 hours
Percent of Water Quality Volume Released in First 24 hours:	58%

The iterative process for sizing the low-flow outlet structure resulted in a final design that provides a steel plate that will be bolted over-top of a 12-inch PVC outlet pipe. The plate will be bolted directly in between the proposed debris screen and headwall. The plate will have a vertical notch with the following dimensions: 2" x 10" (width x height). This design was preferred over the use of a 4.5-inch circular opening, as it will allow the basin to drain in the event that several inches of sediment and/or debris bypass the debris screen and accumulate at the invert of the outlet pipe. The debris screen is discussed in further detail in Section 3.2.5.

A copy of the drawdown time calculation is provided in Appendix D.

3.2.2 Basin Configuration

The configuration of the project site provides a very desirable high aspect ratio, meaning, the length to width ratio far exceeds the minimum 1.5:1 (L:W) as stated in CASQA. The length to width ratio for the entire project site is approximately 5:1, which is also the length to width ratio based on the low-flow channel length versus the width of the basin. A low-flow channel has been provided to direct low flows in a meandering direction, from the edge of the gabion wall, to the downstream low-flow orifice structure.

The depth of the basin is approximately 4.6 feet at its largest depth. However, a depth of 3.6 feet is provided for the water quality volume, measured from the basin spillway crest elevation to the basin bottom. The basin spillway crest elevation has been set to match existing top of channel elevations at the desired spillway location, which (based on surveyed information) shows EL 383.1 at the lowest point and EL 383.2 at the highest point.

Note: Preliminary design had shown the basin spillway crest elevation at EL 384.0, which assumed existing top of channel elevations at EL 385.0, and assumed that the channel wall would be cut down 1-foot to provide the EL 384.0. Based on surveyed data during final design, these elevations were revised and resulted in a decreased depth and available water quality volume.

3.2.3 Pretreatment Sediment Forebay

A sediment forebay has been provided at the upstream end of the basin. The forebay will offer pretreatment for the inflow to the basin, and will help remove sediment from runoff prior to entering the basin. Overall maintenance for the basin will become easier as the majority of maintenance removals should be limited to the removal of sediment and debris from the forebay area. It is worth noting that the majority of overall recurring maintenance for a water quality basin is typically attributed to vegetation management and routine mowing.

Direct maintenance access to the sediment forebay has been provided with a maintenance access road that runs along the eastern side of the basin, ramps up and over the berm that separates the forebay from the main cell of the basin, and down into the forebay bottom. The access road will be built with a finished elevation two-feet higher than the bottom of the basin.

Several fixed vertical sediment depth markers will also be installed in the basin and the sediment forebay area to measure sediment deposition over time, and to help indicate when maintenance is needed. Each of the depth markers will extend 48-inches above the finished grade of the basin at each location. The markers that are proposed on the final plans are actually 48-inch Class 1 (Flexible Post) Delineators with below surface anchors – which are typically used as a traffic delineator/channelizer. Inspections will help indicate the amount of sediment deposition which is occurring over-time. When sediment removal maintenance is required, the originally designed grades should be reestablished by removing the deposited sediment to the top of the concrete anchors. Removal of sediment should occur when the deposited sediment falls within the range of 6-12 inches (or above).

3.2.4 Vegetation and Planting Plan

A planting plan has been prepared for the basin and is included within the final grading plans for the project. It is important to note that the final plan reflects that the low-lying basin floor will be planted with a variety of native grasses, while any larger plantings (i.e trees, shrubs) will be provided along the slopes and higher grounds.

According to CASQA, "mowing should be done at least annually to avoid establishment of woody vegetation, but may need to be performed much more frequently if aesthetics are an important consideration."

3.2.5 Debris Screen for Low-flow Outlet Structure

As part of the final design for the basin, a debris screen has been added to the plans that will help reduce the chance and/or frequency of the low-flow outlet structure becoming clogged. It is more specifically a "Cast Iron Pipe Screen" for a 12-inch pipe. The dimensions of the debris screen are as follows: Height = 13 inches, Length = 18-inches, and Openings = 1-inch.

In addition to the debris screen, the headwall that has been provided for the 12-inch PVC pipe has been enlarged to provide the concrete slab that the screen will be bolted onto, and provides an additional 13.5-inches in length beyond the edge of the screen. This additional length of concrete will help to prevent vegetation from growing in the same location as the debris screen and/or 12-inch PVC pipe.

Please refer to the grading plans for additional details on the debris screen.

3.3 INSPECTION, OPERATION, AND MAINTENANCE OF BASIN

3.3.1 Initial Inspections

The long-term effectiveness of the basin will partially be dependent on the frequency of inspections and maintenance activities. It will be important to inspect the basin after the first large storm event to determine if the desired drawdown (residence) time is achieved and functioning properly (48-72 hours). If the drawdown time is not within the desired parameters, then modifications should be made to the low-flow orifice structure to better provide the desired timeframe. Close attention should also be made to the appearance of possible clogging to the low-flow structure and/or debris screen (refer to Section 3.2.5 above for additional information regarding the debris screen). If it appears that there may be a potential problem with clogging, then additional steps should be taken to help prevent such an occurrence (or increase the inspection frequency until a better comfort level is reached).

3.3.2 Periodic Inspections and Maintenance

As briefly mentioned earlier in this report, the majority of routine maintenance hours is typically spent for vegetation management, such as mowing. Mowing should be done at least annually to avoid establishment of woody vegetation, but may be required more often for aesthetics. According to CASQA, recent Caltrans studies have suggested an average of 72 hours of maintenance annually for similar basins. A significant amount of maintenance time has been attributed to vector control as a result of stilling basins installed as energy dissipaters. However, frequent removal of debris accumulations and vegetation management should help maintain a dewatering time of 48-72 hours, and therefore help prevent mosquito and other vector habitats.

The following list from CASQA details typical inspection and maintenance "activities and frequencies":

- Schedule semiannual inspection for the beginning and end of the wet season for standing water, slope stability, sediment accumulation, trash and debris, and presence of burrows.

- Remove accumulated trash and debris in the basin and around the riser pipe during semiannual inspections. The frequency of this activity may be altered to meet specific site conditions.
- Trim vegetation at the beginning and end of the wet season and inspect monthly to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove sediment and regrade about every 10 years or when the accumulated sediment volume exceeds 10 percent of the basin volume. Inspect the basin each year for accumulated sediment volume.

Specifically, the basin and/or sediment forebay area should be maintained when 6-12 inches of sediment deposition has occurred. The five (5) sediment depth markers shown on the plans will help in determining the depth of deposited sediment. Specifically, the markers will extend 48-inches above the finished grade of the basin bottom.

According to CASQA, the typical "annual cost of routine maintenance is typically estimated at 3 to 5 percent of the construction cost." An alternative cost estimate may be formed by summing the costs for the annual inspections, maintenance, vector control issues, administration, and materials that would be anticipated for the basin.

4.0 DETENTION

4.1 DETENTION CHARACTERISTICS

The purpose of this project is primarily for water quality; however, the creation of additional storage volume on the project site will also help reduce the magnitude of flooding to the adjacent property and Woodside Ave. The existing flooding characteristics of the site have been considered in the design layout of the basin and the several hydraulic conveyance systems that will be necessary to contain and/or convey both the low-flow and flood-sized storm events. The following table details the total volume of storage provided prior to overtopping of the basin, and also shows the amount of runoff that is expected to discharge from the project site during both the pre-project and post-project 100-year peak storm events:

Table 4.1 - Summary of Detention Characteristics for Water Quality Basin at Woodside Avenue

Total Detention Volume (V_{TOT}), acre-ft:	5.2 [1]
Pre-project 'Undetained' 100-Year Peak Runoff (Q_{100}), cfs:	1404
Post-project 'Detained by WQ basin' 100-Year Peak Runoff (Q_{100}), cfs:	1371

Note 1 - This is the total volume that can be credited for storage during larger, flood-sized storm events, prior to overflow occurring at an elevation of 384.1. The volume is measured from basin bottom to the invert of the existing berm (which will act as an emergency spillway), at approximately 384.1, which allows overflow to Woodside Ave located to the north. It is important to note that overflow also occurs over the top of the existing concrete (cobble) channel located along the western edge of the property that allows overflow to the adjacent properties located to the west (overflow towards this area begins to occur at approximately 384.2 – based on the lowest adjacent grade).

The reduction in peak runoff from pre-project to post-project conditions is minor since the basin begins to fill during the initial stages of rainfall and when the peak in runoff occurs, the storage volume within the basin has already been filled.

A copy of the final proposed volume computations is provided as part of Appendix C.

4.2 DETENTION METHODOLOGY AND CRITERIA

A modified rational method hydrograph synthesizing procedure was used to generate an inflow hydrograph for the water quality basins based on the modified rational method results. The United States Army Corps of Engineers' HEC-1 hydrologic model was used to analyze the actual detention that occurs due to the basin.

4.2.1 Rational Method Hydrograph Synthesizing Procedure Methodology and Criteria:

The flood-control effectiveness of a detention facility requires an inflow hydrograph to obtain the amount of runoff that will be detained based on the provided storage volume. The modified rational method only yields a peak discharge and time of concentration, and does not yield a hydrograph. In order to convert the peak discharge and time of concentration into a hydrograph, a modified rational method hydrograph synthesizing procedure was used. The modified rational method hydrograph synthesizing procedure methodology and criteria that were used are described in Section 6.0, Rational Method Hydrograph Procedure, of the *San Diego County Hydrology Manual June 2003*.

A copy of the results for the synthesizing procedure is included at the back of Appendix E.

4.2.2 HEC-1 Methodology and Criteria:

The 100-year 6-hour storm event hydrograph was used in the HEC-1 hydrologic model to perform routing calculations for the detention basin. The results of the analysis show a reduction in peak runoff from the pre-project discharge (Q_{100} = 1404 cfs), to the post-project discharge (Q_{100} = 1371 cfs).

A copy of the results for the HEC-1 detention analysis is included in Appendix E.

5.0 HYDRAULICS

There are several components of the basin that require hydraulic considerations. As discussed throughout this report, flooding has been a problem under pre-project conditions and will still continue to be a problem in the vicinity of the project site under post-project conditions. However, as part of the basin design, each spillway (and/or conveyance system) has been designed in order to convey the required amount of runoff such that the magnitude and frequency of flooding will not be worsened for any of the surrounding areas. As discussed in Section 4.0 of this report, the amount of flooding will actually decrease as a result of an increase in storage volume on-site.

5.1 FOREBAY SPILLWAY – Into Water Quality Basin

The forebay has been separated from the rest of the basin by the installation of a gabion wall. The gabion wall will allow ponded water within the forebay to filter through the gabions and into the basin. However, during larger storm events, the ponded water will reach a set elevation where it will begin to overtop the gabion wall and flow directly into the basin. The top of the gabion wall will act as an overflow spillway (weir), and is sized to convey most of the 100-year peak storm event without allowing overtopping of the exterior berm surrounding the forebay and basin. However, the weir length and amount of head provided above the proposed gabion wall and maintenance access road fall slightly short of what would actually convey the entire 100-year peak storm event (1404 cfs). The small difference (1364 cfs versus 1404 cfs) is not significant since the entire basin would already be full and spilling over due to the backwater effects from the undersized twin culverts located at the downstream end of the basin.

A copy of the weir calculation has been provided in Appendix F.

5.2 BASIN SPILLWAY – Into Existing Channel and Culverts

A spillway has been provided at the downstream end of the basin that will convey a specified flow into the existing concrete (cobble) channel and into the existing pair of CMP culverts (under Woodside Ave.). The main criterion that has been used to size this spillway is the limited conveyance available through the existing culverts. According to the MDP, the two culverts have a combined capacity of 236 cfs. However, utilizing the inlet control charts issued by the Bureau of Public Roads, the two culverts combine for a "inlet control" capacity of 200 cfs (assuming the available head is 4.9-feet; 384.1 minus 379.2). Since the MDP capacity of 236 cfs is greater, the basin spillway has been sized to pass this larger amount of peak runoff.

Under both the pre-project and post-project conditions, once the two culverts reach their capacity under the maximum available head, overtopping begins to occur towards both the western property and onto Woodside Ave. Therefore, the spillway into the portion of the existing channel that will remain, has been sized to provide conveyance of 236 cfs under 1-foot of head. The top of the spillway has been set at EL 383.1 (based on the existing top of channel elevations – per the field survey performed by Rick Engineering Company), while the adjacent sides to the north and west of the spillway are at existing minimum elevations of EL 384.1.

A copy of the weir calculation has been provided in Appendix F.

5.3 EX. EMERGENCY SPILLWAY – On to Western Property and Woodside Ave.

The project currently proposes to leave the adjacent grades to the west and north (Woodside Ave) as-is. When flooding on-site reaches an elevation of EL 384.1, overtopping of the basin will continue to occur as it does under pre-project conditions. It was apparent during a field visit that the northern edge of the basin property functions as an emergency spillway under pre-project conditions. The existing berm, sidewalk, and roadway will continue to receive overflow from the project site as it does today. However, as discussed earlier in this report, the magnitude and frequency of flooding should be decreased (although only slightly for large storm events) as a result of the additional storage provided as part of this project.

6.0 CONCLUSION

The design of the water quality basin was based on maximizing the available volume on-site without creating a permanent pool. A permanent pool was undesirable, as they tend to cause problems with vector control issues (i.e. mosquito breeding). Important constraints with which the design was based upon included the existing inflow and outflow invert elevations and the existing elevations surrounding the project site (along the edge of the vacant property). It is well known that flooding is a major problem in the vicinity of the project (as documented within the MDP), therefore, since this project provides a significant amount of sediment removal and will create additional storage volume on-site, detention will help to reduce the magnitude and frequency of flooding (although only slightly).

The extended detention basin has been designed to include a sediment forebay that will be separated from the main portion of the basin with a gabion wall. The gabion wall has a height of 2-feet that will help retain accumulated sediment and debris while letting low-flows trickle through. During larger storm events, overflow of the gabion wall will occur, therefore, 2.5-feet of additional height has been provided above the wall to provide the necessary conveyance of the 100-year peak storm event (as determined during the MDP by the County of San Diego).

The main portion of the basin will be graded such that there will be a defined pilot channel that will direct low-flows in a meandering pattern and eventually to the low-flow orifice structure at the downstream end of the basin. The entire basin bottom will be vegetated with native grasses and other low-lying, easily maintained vegetation. Larger plantings and trees will be provided along the slopes and upper portions of the surrounding berms.

The low-flow orifice has been designed to drain the basin in 48-72 hours for a combination of maximizing water quality treatment while minimizing vector control influences. An access road has been provided for maintenance purposes. Inspections and maintenance activities will occur on a frequent basis, as recommended by CASQA and/or additional agencies.

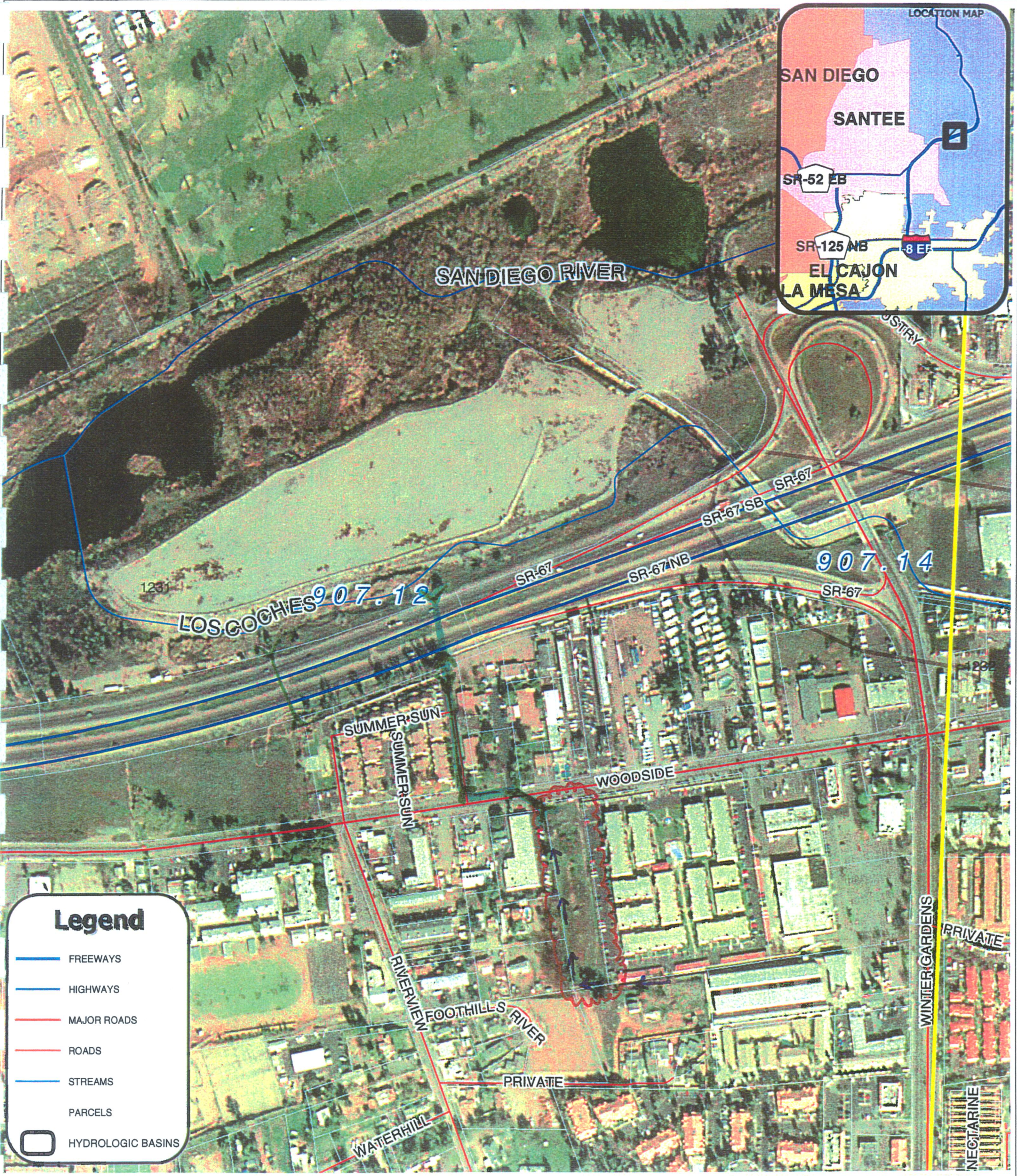
Large storm events will still cause overtopping of the existing concrete channel wall along the western boundary and of the existing berm along the northern edge of the property (Woodside Ave.). While the project will reduce the magnitude and frequency of flooding to these areas, flooding will still occur in the post-project condition.

Overall, the proposed project will provide a combination of water quality and flood control benefits (primarily water quality). As part of the project, any existing arundo on-site will be removed as part of the grading process. The effects of the water quality treatment will be seen over the years to come as part of an ongoing monitoring and sampling plan that is currently under final design as part of the project.

Copies of Grading Plan Sheets 2 through 5 have been provided in Map Pocket 1 of this report (for reference only). The sheets include some of the relevant details, constraints, and plan view information as they pertain to this report.

APPENDIX A

Vicinity Map



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ENGINEERING COMPANY
PREPARED BY
GIS SERVICES DIVISION

1 inch equals 403.993874 feet

0 175 350 700 Feet

EXHIBIT DATE: 11-18-04 REC JN: 14804-B

WOODSIDE AVENUE WATER QUALITY BASIN [VICINITY MAP]

THIS PROJECT LOCATED WITHIN THE COUNTY OF SAN DIEGO

APPENDIX B

Copy of AES
Integrated Rational Method/UH Method
Computer program output,
and
8.5" x 11" Master Drainage Plan Exhibit

PAGE 1 OF ANALYSIS

"WITHOUT DETENTION"

-Reflects the existing conditions at the time of the Woodside Ave Water Quality Basin project.

****

INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2001 Advanced Engineering Software (aes)
Ver. 1.5A Release Date: 01/01/2001 License ID 1549

Analysis prepared by:

FILE NAME: SF1802ZZ.Z11
TIME/DATE OF STUDY: 16:23 01/20/2005

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.670
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK-SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	44.0	20.0	0.020/0.020/0.020	0.67	2.00	0.0313	0.167	0.0160
2	32.0	20.0	0.020/0.020/0.020	0.67	2.00	0.0313	0.167	0.0160
3	34.0	20.0	0.020/0.020/0.020	0.67	2.00	0.0313	0.167	0.0160
4	26.0	20.0	0.020/0.020/0.020	0.67	2.00	0.0313	0.167	0.0160
5	32.0	20.0	0.020/0.020/0.020	0.50	1.50	0.0313	0.125	0.0160
6	20.0	15.0	0.020/0.020/0.020	0.50	1.50	0.0313	0.125	0.0160
7	18.0	10.0	0.020/0.020/0.020	0.50	1.50	0.0313	0.125	0.0160
8	54.0	20.0	0.020/0.020/0.020	0.67	2.00	0.0313	0.167	0.0160
9	42.0	20.0	0.020/0.020/0.020	0.67	2.00	0.0313	0.167	0.0160

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
S.C.S. S-GRAPH USED.
TYPE B: 6-HOUR DESIGN STORM USED.
TYPE B: 24-HOUR DESIGN STORM USED.
ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR UNIT HYDROGRAPH METHOD

****

FLOW PROCESS FROM NODE SF180200.0 TO NODE SF180201.0 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

==

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .4500
SOIL CLASSIFICATION IS "B"
S.C.S. CURVE NUMBER (AMC II) = 80
INITIAL SUBAREA FLOW-LENGTH = 492.15
UPSTREAM ELEVATION = 850.00
DOWNSTREAM ELEVATION = 675.62
ELEVATION DIFFERENCE = 174.38
URBAN SUBAREA OVERLAND TIME OF FLOW(MINUTES) = 7.904
*CAUTION: SUBAREA SLOPE EXCEEDS COUNTY NOMOGRAPH
DEFINITION. EXTRAPOLATION OF NOMOGRAPH USED.
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.236
SUBAREA RUNOFF(CFS) = 7.30
TOTAL AREA(ACRES) = 3.10 TOTAL RUNOFF(CFS) = 7.30

PAGE 29
OF
ANALYSIS

*The following pages include the areas of the Woodside Ave Water Quality Basin project, & the downstream portion to the end of the study

```
****************************************************************************
  FLOW PROCESS FROM NODE SF180264.0 TO NODE SF180264.0 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM      RUNOFF      Tc      INTENSITY      AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1        398.44     31.13       2.163       360.51
  LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180264.00 = 11125.56 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM      RUNOFF      Tc      INTENSITY      AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1        542.09     19.02       2.972       478.70
  LONGEST FLOWPATH FROM NODE 180220.00 TO NODE 180264.00 = 11003.19 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF        Tc        INTENSITY
  NUMBER      (CFS)      (MIN.)     (INCH/HOUR)
     1       832.03      19.02         2.972
     2       792.92      31.13         2.163

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     832.03    Tc(MIN.) =    19.02
  TOTAL AREA(ACRES) =     839.21

****************************************************************************
  FLOW PROCESS FROM NODE SF180264.0 TO NODE SF180264.0 IS CODE =  71
----------------------------------------------------------------------------
  >>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
  >>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<
============================================================================
  UNIT-HYDROGRAPH DATA:
   S-GRAPH: S.C.S.=100.0%;VALLEY(DEV.)=  0.0%;FOOTHILL=  0.0%;DESERT=  0.0%
   Tc(HR) = 0.32; LAG(HR) = 0.25
   AREA-AVERAGED CURVE NUMBER = 94.     MINIMUM LOSS RATE(INCH/HOUR) =  0.04
   COUNTY OF SAN DIEGO DEPTH-AREA FACTORS USED WITH AMC III CONDITION.
   UNIT-INTERVAL(MIN) =   5.00    TOTAL AREA(ACRES) =     839.21
   LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180264.00 = 11125.56 FEET.
   EQUIVALENT BASIN FACTOR (VERSUS Lca/L RATIO) APPROXIMATIONS:
   Lca/L=0.3,n=.0269;Lca/L=0.4,n=.0241;Lca/L=0.5,n=.0221;Lca/L=0.6,n=.0207
  RAINFALL(INCH):6H= 2.66 for Type B Storm.
   TIME OF PEAK FLOW(HR) =   2.58  RUNOFF VOLUME(AF) =        135.55
  RAINFALL(INCH):24H= 5.83 for Type B Storm.
   TIME OF PEAK FLOW(HR) =   9.58  RUNOFF VOLUME(AF) =        317.93
  UNIT-HYDROGRAPH PEAK FLOW RATE(CFS): 6H =     1351.08; 24H =     902.22
  UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) =     1351.08
  RATIONAL METHOD PEAK FLOW RATE(CFS) =      832.03
   (UPSTREAM NODE PEAK FLOW RATE(CFS) =      832.03)
  PEAK FLOW RATE(CFS) USED =    1351.08

****************************************************************************
  FLOW PROCESS FROM NODE SF180264.0 TO NODE SF180265.0 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     383.44  DOWNSTREAM(FEET) =     381.66
  CHANNEL LENGTH THRU SUBAREA(FEET) =    493.05    CHANNEL SLOPE =  0.0036
  CHANNEL BASE(FEET) =    18.00    "Z" FACTOR =    0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =    6.00
  CHANNEL FLOW THRU SUBAREA(CFS) =    1351.08
  FLOW VELOCITY(FEET/SEC) =  13.54   FLOW DEPTH(FEET) =    5.54
  TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =  19.63
  LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180265.00 = 11618.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE SF180265.0 TO NODE SF180266.0 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     381.66  DOWNSTREAM(FEET) =     380.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    200.09    CHANNEL SLOPE =  0.0058
  CHANNEL BASE(FEET) =     7.00    "Z" FACTOR =    2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =    6.00
```

```
      ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
          CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
          ALLOWABLE DEPTH).
          AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
          ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

 CHANNEL FLOW THRU SUBAREA(CFS) =   1351.08
 FLOW VELOCITY(FEET/SEC) =  11.85   FLOW DEPTH(FEET) =   6.00
 TRAVEL TIME(MIN.) =   0.28   Tc(MIN.) =  19.91

 ==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

 LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180266.00 = 11818.70 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE SF180266.0 TO NODE SF180266.0 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.885
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4000
 SOIL CLASSIFICATION IS "C"
 S.C.S. CURVE NUMBER (AMC II) =  84
 AREA(ACRES) =    16.20
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8000
 SOIL CLASSIFICATION IS "C"
 S.C.S. CURVE NUMBER (AMC II) =  91
 AREA(ACRES) =     9.40
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "B"
 S.C.S. CURVE NUMBER (AMC II) =  78
 AREA(ACRES) =     8.70
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "B"
 S.C.S. CURVE NUMBER (AMC II) =  90
 AREA(ACRES) =     4.00
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  92
 AREA(ACRES) =     0.10
 SUBAREA AVERAGE RUNOFF COEFFICIENT =  0.5242
 SUBAREA AREA(ACRES) =   38.40
 UNIT-HYDROGRAPH DATA:
  S-GRAPH: S.C.S.=100.0%;VALLEY(DEV.)=  0.0%;FOOTHILL=  0.0%;DESERT=  0.0%
  Tc(HR) = 0.33; LAG(HR) = 0.27
  AREA-AVERAGED CURVE NUMBER = 94.    MINIMUM LOSS RATE(INCH/HOUR) =  0.04
  COUNTY OF SAN DIEGO DEPTH-AREA FACTORS USED WITH AMC III CONDITION.
  UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =     877.61
  LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180266.00 = 11818.70 FEET.
  EQUIVALENT BASIN FACTOR (VERSUS Lca/L RATIO) APPROXIMATIONS:
  Lca/L=0.3,n=.0266;Lca/L=0.4,n=.0238;Lca/L=0.5,n=.0219;Lca/L=0.6,n=.0204
 RAINFALL(INCH):6H= 2.66 for Type B Storm.
  TIME OF PEAK FLOW(HR) =  2.58  RUNOFF VOLUME(AF) =     141.65
 RAINFALL(INCH):24H= 5.82 for Type B Storm.
  TIME OF PEAK FLOW(HR) =  9.58  RUNOFF VOLUME(AF) =     331.79
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS): 6H =    1393.29; 24H =     941.41
 TOTAL AREA(ACRES) =    877.61   PROGRAM PEAK FLOW(CFS) =  1393.29
 TC(MIN) =  19.91

 SUBAREA AREA-AVERAGED RAINFALL DEPTH(INCH):
  6HR = 2.65; 24HR = 5.70

****************************************************************************
 FLOW PROCESS FROM NODE SF180266.0 TO NODE SF180267.0 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    380.50  DOWNSTREAM(FEET) =    379.40
 CHANNEL LENGTH THRU SUBAREA(FEET) =    649.99   CHANNEL SLOPE =  0.0017
 CHANNEL BASE(FEET) =     3.00    "Z" FACTOR =    1.000
 MANNING'S FACTOR = 0.020  MAXIMUM DEPTH(FEET) =    5.00

      ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
          CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
          ALLOWABLE DEPTH).
          AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
          ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.
```

```
CHANNEL FLOW THRU SUBAREA(CFS) =    1393.29
FLOW VELOCITY(FEET/SEC) =   34.83    FLOW DEPTH(FEET) =    5.00
TRAVEL TIME(MIN.) =    0.31    Tc(MIN.) =   20.22

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180267.00 = 12468.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE SF180267.0 TO NODE SF180267.0 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.857
  MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  82
  AREA(ACRES) =      4.20
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  92
  AREA(ACRES) =      3.90
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  90
  AREA(ACRES) =      1.90
  MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "C"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA(ACRES) =      0.70
  RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4000
  SOIL CLASSIFICATION IS "C"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA(ACRES) =      0.30
  SUBAREA AVERAGE RUNOFF COEFFICIENT =  0.6709
  SUBAREA AREA(ACRES) =    11.00
  UNIT-HYDROGRAPH DATA:
   S-GRAPH: S.C.S.=100.0%;VALLEY(DEV.)=  0.0%;FOOTHILL=  0.0%;DESERT=  0.0%
   Tc(HR) = 0.34; LAG(HR) = 0.27
   AREA-AVERAGED CURVE NUMBER = 94.    MINIMUM LOSS RATE(INCH/HOUR) =  0.04
   COUNTY OF SAN DIEGO DEPTH-AREA FACTORS USED WITH AMC III CONDITION.
   UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =    888.61
   LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180267.00 = 12468.69 FEET.
   EQUIVALENT BASIN FACTOR (VERSUS Lca/L RATIO) APPROXIMATIONS:
   Lca/L=0.3,n=.0257;Lca/L=0.4,n=.0230;Lca/L=0.5,n=.0212;Lca/L=0.6,n=.0197
  RAINFALL(INCH):6H= 2.66 for Type B Storm.
   TIME OF PEAK FLOW(HR) =   2.58  RUNOFF VOLUME(AF) =      143.46
  RAINFALL(INCH):24H= 5.82 for Type B Storm.
   TIME OF PEAK FLOW(HR) =   9.58  RUNOFF VOLUME(AF) =      336.02
  UNIT-HYDROGRAPH PEAK FLOW RATE(CFS): 6H =     1403.64; 24H =     952.46
  TOTAL AREA(ACRES) =    888.61    PROGRAM PEAK FLOW(CFS) =  1403.64
  TC(MIN) =  20.22

  SUBAREA AREA-AVERAGED RAINFALL DEPTH(INCH):
   6HR = 2.67; 24HR = 5.73

****************************************************************************
  FLOW PROCESS FROM NODE SF180267.0 TO NODE SF180268.0 IS CODE =  47
----------------------------------------------------------------------------
  >>>>>COMPUTE CULVERT TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED CULVERT SIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    379.40  DOWNSTREAM(FEET) =    377.88
  FLOW LENGTH(FEET) =    153.12   MANNING'S N =  0.014
  Notes:
    1. Reference: "Hydraulic Charts for the Selection of
       Highway Culverts", Hydraulic Engineering Circular No. 5,
       December 1965, Federal Highway Administration.
    2. INLET control for all Culvert Analysis.
    3. Headwater depth is ASSUMED to be 3 FEET above the culvert soffit.
  GIVEN BOX CULVERT HEIGHT(FEET) =    3.00
  GIVEN BOX CULVERT BASEWIDTH(FEET) =     7.60
  ESTIMATED BOX CULVERT BASEWIDTH(FEET) =    45.28

  *NOTE: CULVERT-FLOW VELOCITY AND TRAVEL TIME
         ARE BASED ON ESTIMATED CULVERT SIZE.
  CULVERT-FLOW VELOCITY(FEET/SEC.) =  10.33
  CULVERT-FLOW(CFS) =    1403.64
```

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CULVERT-FLOW TRAVEL TIME(MIN.) =    0.25    Tc(MIN.) =  20.47
LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180268.00 = 12621.81 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE SF180268.0 TO NODE SF180268.0 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.835
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  90
  AREA(ACRES) =     20.20
  MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  82
  AREA(ACRES) =      6.50
  RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4000
  SOIL CLASSIFICATION IS "C"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA(ACRES) =      1.50
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  92
  AREA(ACRES) =      1.20
  MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  90
  AREA(ACRES) =      0.90
  MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "C"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA(ACRES) =      0.50
  SUBAREA AVERAGE RUNOFF COEFFICIENT =  0.6802
  SUBAREA AREA(ACRES) =    30.80
  UNIT-HYDROGRAPH DATA:
   S-GRAPH: S.C.S.=100.0%;VALLEY(DEV.)=  0.0%;FOOTHILL=  0.0%;DESERT=  0.0%
   Tc(HR) = 0.34; LAG(HR) = 0.27
   AREA-AVERAGED CURVE NUMBER = 94.    MINIMUM LOSS RATE(INCH/HOUR) =  0.04
   COUNTY OF SAN DIEGO DEPTH-AREA FACTORS USED WITH AMC III CONDITION.
   UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =     919.41
   LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180268.00 = 12621.81 FEET.
   EQUIVALENT BASIN FACTOR (VERSUS Lca/L RATIO) APPROXIMATIONS:
   Lca/L=0.3,n=.0257;Lca/L=0.4,n=.0230;Lca/L=0.5,n=.0212;Lca/L=0.6,n=.0198
  RAINFALL(INCH):6H= 2.66 for Type B Storm.
   TIME OF PEAK FLOW(HR) =  2.58  RUNOFF VOLUME(AF) =      148.40
  RAINFALL(INCH):24H= 5.82 for Type B Storm.
   TIME OF PEAK FLOW(HR) =  9.58  RUNOFF VOLUME(AF) =      347.22
  UNIT-HYDROGRAPH PEAK FLOW RATE(CFS): 6H =    1446.29; 24H =     984.29
  TOTAL AREA(ACRES) =    919.41   PROGRAM PEAK FLOW(CFS) =  1446.29
  TC(MIN) =  20.47

  SUBAREA AREA-AVERAGED RAINFALL DEPTH(INCH):
   6HR = 2.66; 24HR = 5.69

****************************************************************************
  FLOW PROCESS FROM NODE SF180268.0 TO NODE SF180269.0 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     377.88  DOWNSTREAM(FEET) =     377.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =    109.01   CHANNEL SLOPE =  0.0026
  CHANNEL BASE(FEET) =     6.00    "Z" FACTOR =    1.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =    5.00

        ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
            CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
            ALLOWABLE DEPTH).
            AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
            ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

  CHANNEL FLOW THRU SUBAREA(CFS) =    1446.29
  FLOW VELOCITY(FEET/SEC) =  26.30    FLOW DEPTH(FEET) =    5.00
  TRAVEL TIME(MIN.) =    0.07    Tc(MIN.) =  20.53

  ==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

  LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180269.00 = 12730.82 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE SF180269.0 TO NODE SF180270.0 IS CODE =  42
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>USING USER-SPECIFIED PIPESIZE(PARALLEL/REPLACEMENT PIPESIZE ESTIMATED)<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   377.60
  DOWNSTREAM NODE ELEVATION(FEET) =   376.00
  FLOW LENGTH(FEET) =   375.98   MANNING'S N =  0.014

  USER SPECIFIED PIPE DIAMETER(INCH) =  54.00    NUMBER OF PIPES =   1
  USER SPECIFIED PIPE SYSTEM UNDER PRESSURE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.90
  PIPE-FLOW(CFS) =    109.84
  PIPEFLOW TRAVEL TIME(MIN.) =   0.91    Tc(MIN.) =  21.44

  *DEFICIENCY ANALYSIS(BASED ON REPLACEMENT SYSTEM HYDROLOGY):
  *REPLACEMENT PIPE SYSTEM (MANNING'S N = .0140):
  ESTIMATED PIPE DIAMETER(INCH) = 144.00    NUMBER OF PIPES =   1
  DEPTH OF FLOW IN 144.0 INCH PIPE IS 113.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.12
  PIPE-FLOW(CFS) =   1446.29
  PIPEFLOW TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =  20.95

  *PARALLEL PIPE SYSTEM (MANNING'S N = .0140):
  PIPE DIAMETER(INCH) = 138.00    NUMBER OF PIPES =   1
  LONGEST FLOWPATH FROM NODE 180121.00 TO NODE 180270.00 = 13106.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE SF180281.0 TO NODE SF180282.0 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  USER SPECIFIED Tc(MIN.) =   22.740
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.648
  SUBAREA RUNOFF(CFS) =       0.01
  TOTAL AREA(ACRES) =       0.01   TOTAL RUNOFF(CFS) =       0.01

  SUBAREA AREA-AVERAGED RAINFALL DEPTH(INCH):
   6HR = 2.66; 24HR = 5.69

****************************************************************************
  FLOW PROCESS FROM NODE SF180282.0 TO NODE SF180282.0 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =   665.29(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   919.41(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   665.29  AREA(AC.) =   919.41
  * SUMMED DATA: FLOW(CFS) =   665.30    TOTAL AREA(ACRES) =   919.42

****************************************************************************
  FLOW PROCESS FROM NODE SF180282.0 TO NODE SF180283.0 IS CODE =  47
----------------------------------------------------------------------------
  >>>>>COMPUTE CULVERT TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED CULVERT SIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   375.00  DOWNSTREAM(FEET) =   374.00
  FLOW LENGTH(FEET) =   186.06   MANNING'S N =  0.014
  Notes:
    1. Reference: "Hydraulic Charts for the Selection of
       Highway Culverts", Hydraulic Engineering Circular No. 5,
       December 1965, Federal Highway Administration.
    2. INLET control for all Culvert Analysis.
    3. Headwater depth is ASSUMED to be 3 FEET above the culvert soffit.
  GIVEN BOX CULVERT HEIGHT(FEET) =   3.00
  GIVEN BOX CULVERT BASEWIDTH(FEET) =   18.00
  ESTIMATED BOX CULVERT BASEWIDTH(FEET) =   21.46

  *NOTE: CULVERT-FLOW VELOCITY AND TRAVEL TIME
         ARE BASED ON ESTIMATED CULVERT SIZE.
  CULVERT-FLOW VELOCITY(FEET/SEC.) =  10.33
  CULVERT-FLOW(CFS) =    665.30
  CULVERT-FLOW TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =  23.04
  * TOTAL SOURCE FLOW(CFS) =    665.29
```

```
 LONGEST FLOWPATH FROM NODE 180281.00 TO NODE 180283.00 =   249.17 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE SF180291.0 TO NODE SF180292.0 IS CODE =  22
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 USER SPECIFIED Tc(MIN.) =   22.740
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.648
 SUBAREA RUNOFF(CFS) =      0.01
 TOTAL AREA(ACRES) =       0.01   TOTAL RUNOFF(CFS) =       0.01

 SUBAREA AREA-AVERAGED RAINFALL DEPTH(INCH):
  6HR = 2.66; 24HR = 5.69

****************************************************************************
 FLOW PROCESS FROM NODE SF180292.0 TO NODE SF180292.0 IS CODE =  16
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
 USER-SPECIFIED CONSTANT SOURCE FLOW =   781.00(CFS)
 USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   919.41(ACRES)
 * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   781.00  AREA(AC.) =   919.41
 * SUMMED DATA: FLOW(CFS) =   781.01     TOTAL AREA(ACRES) =   919.42

****************************************************************************
 FLOW PROCESS FROM NODE SF180292.0 TO NODE SF180292.0 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.648
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA(ACRES) =      8.70
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4000
 SOIL CLASSIFICATION IS "C"
 S.C.S. CURVE NUMBER (AMC II) =  84
 AREA(ACRES) =      4.20
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "B"
 S.C.S. CURVE NUMBER (AMC II) =  78
 AREA(ACRES) =      3.60
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  87
 AREA(ACRES) =      2.40
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SOIL CLASSIFICATION IS "B"
 S.C.S. CURVE NUMBER (AMC II) =  80
 AREA(ACRES) =      2.20
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "B"
 S.C.S. CURVE NUMBER (AMC II) =  90
 AREA(ACRES) =      0.90
 SUBAREA AVERAGE RUNOFF COEFFICIENT =  0.4759
 SUBAREA AREA(ACRES) =    22.00   SUBAREA RUNOFF(CFS) =    27.73
 TOTAL AREA(ACRES) =    22.01   TOTAL RUNOFF(CFS) =    27.74
 TC(MIN) =  22.74

 SUBAREA AREA-AVERAGED RAINFALL DEPTH(INCH):
  6HR = 2.64; 24HR = 5.64

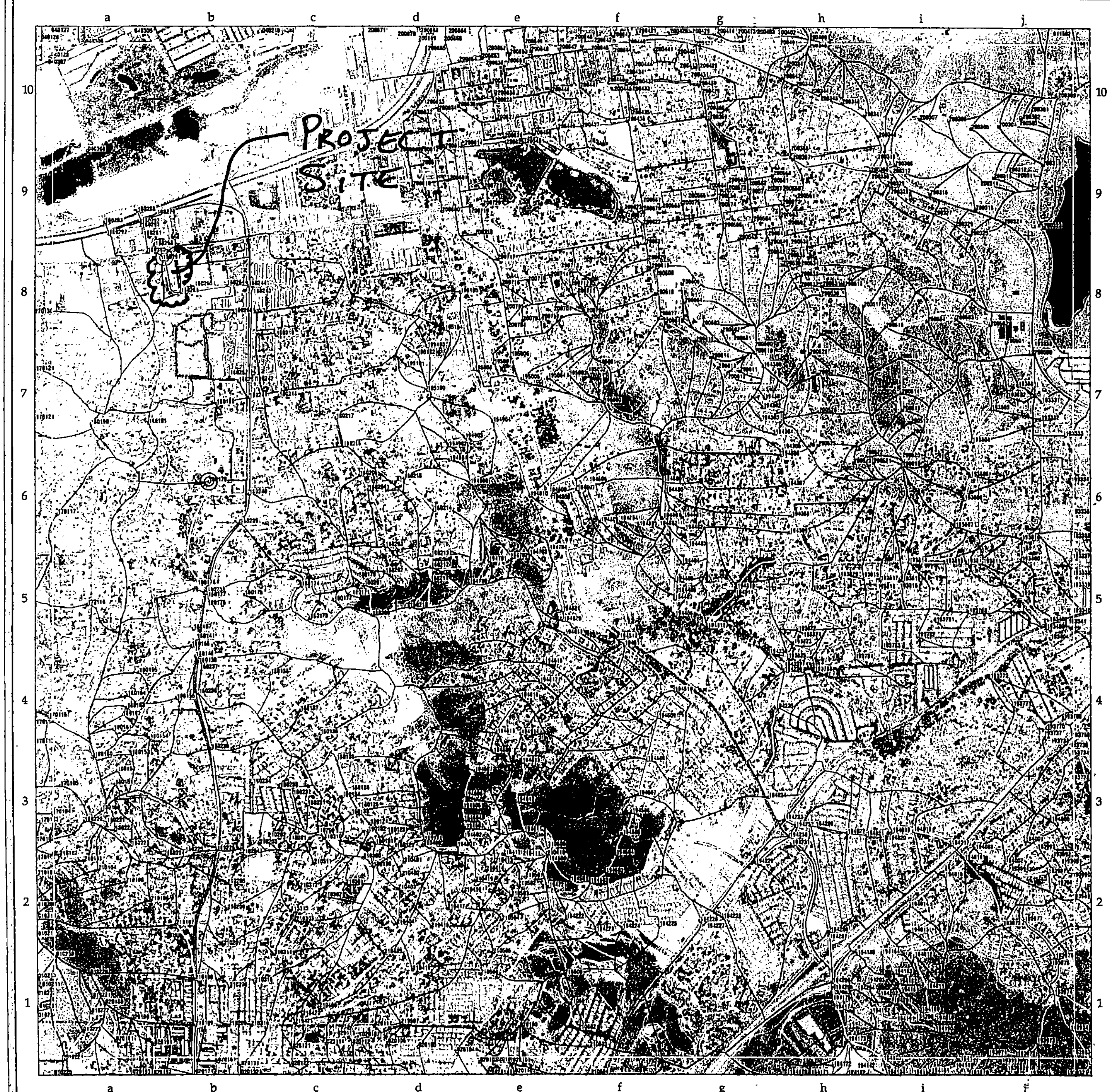
 * SOURCE FLOW DATA: FLOW(CFS) =   781.00     AREA(ACRES) =   919.41
 * SUMMED DATA: FLOW(CFS) =   808.74     TOTAL AREA(ACRES) =   941.42

****************************************************************************
 FLOW PROCESS FROM NODE SF180292.0 TO NODE SF180293.0 IS CODE =  47
----------------------------------------------------------------------------
 >>>>>COMPUTE CULVERT TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED CULVERT SIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   374.00  DOWNSTREAM(FEET) =   373.00
 FLOW LENGTH(FEET) =   184.13   MANNING'S N =  0.014
 Notes:
   1. Reference: "Hydraulic Charts for the Selection of
```

```
     Highway Culverts", Hydraulic Engineering Circular No. 5,
     December 1965, Federal Highway Administration.
  2. INLET control for all Culvert Analysis.
  3. Headwater depth is ASSUMED to be 3 FEET above the culvert soffit.
GIVEN BOX CULVERT HEIGHT(FEET) =   3.00
GIVEN BOX CULVERT BASEWIDTH(FEET) =   18.00
ESTIMATED BOX CULVERT BASEWIDTH(FEET) =   26.09

*NOTE: CULVERT-FLOW VELOCITY AND TRAVEL TIME
       ARE BASED ON ESTIMATED CULVERT SIZE.
CULVERT-FLOW VELOCITY(FEET/SEC.) = 10.33
CULVERT-FLOW(CFS) =    808.74
CULVERT-FLOW TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =  23.04
* TOTAL SOURCE FLOW(CFS) =    781.00
LONGEST FLOWPATH FROM NODE 180291.00 TO NODE 180293.00 =   691.21 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =      22.01  TC(MIN.) =      23.04
PEAK FLOW RATE(CFS)    =      27.74
* CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =    781.00  AREA(AC.) =    919.41
* SUMMED DATA: FLOW(CFS) =    808.74    TOTAL AREA(ACRES) =    941.42
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS

0
```



County Flood Control Master Plan

Facilities Map 17

Hydrologic Layout Legend

- Basin
- Facility (link)
- Recommended Facility
- Node
- Water Quality Basin
- Detension Basin
- 030207 Node ID number

Recommended Facilities

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Basemap Legend

- SDA Boundary
- USGS 40-ft Elevation Contours

MAP NOTES

Map Projection –Stateplane NAD83 Feet
Orthophoto Base –USGS 1994-95 DOQQs
Image resolution –6 ft

0 250 500 1000 1500 2000 Feet

1 inch = 500 feet

NOLTE

Hromadka & Associates

TAIC

Date: 01/21/04

APPENDIX C

Numerical Sizing Criteria Calculations

and

Final Proposed Volume Computations

RICK ENGINEERING COMPANY
5620 Friars Road • San Diego, California 92110-2596 • (619) 291-3588 • www.rickengineering.com

12/10/04
14804-B

NUMERIC SIZING CRITERIA CALCULATIONS:

Given: Tributary Area, A (acres) = 889 AC.

85% Map shows P (in) = 0.63 in.

Runoff Coefficient, C = 0.8 (assumed per highly developed tributary area)

Intensity, i (in/hr) = 0.2 in/hr

FLOW BASED

$$Q_T = C\,i\,A$$
$$= (0.8)(0.2\ \text{in/hr})(889\ \text{AC.})$$
$$= 142\ \text{cfs}$$

VOLUME BASED

$$WQ_V = CPA$$
$$= (0.8)(0.63\ \text{in})(889\ \text{AC.})$$
$$= 448.1\ \text{AC-in} \cdot \frac{1\ \text{ft}}{12\ \text{in}} = 37.3\ \text{AC-FT}$$

Type.... Vol: Elev-Area
Name.... PROPOSED

File.... C:\SCRATCH\14804B.PPK
Title... Proposed Volumes

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
379.50	-----	.0000	.0000	.000	.000
380.00	-----	.2350	.2350	.039	.039
381.00	-----	1.1700	1.9294	.643	.682
382.00	-----	1.3920	3.8382	1.279	1.962
383.00	-----	1.5200	4.3666	1.456	3.417
384.00	-----	1.6380	4.7359	1.579	4.996
384.10	-----	1.6380	4.9140	.164	5.160

TOTAL IN BASIN & BASIN SPILLWAY = 5.160 + 0.069 = 5.23 AC.-FT

Elevations With Areas Interpolated From
The Closest Two Planimeter Readings

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
383.10	-----	1.5316	4.5774	.153	3.570

BASIN SPILLWAY ELEVATION

WATER QUALITY VOLUME
WQ_v = 3.6 AC.-FT.

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Interpolated area from closest two given contour areas
is computed using the relationship:

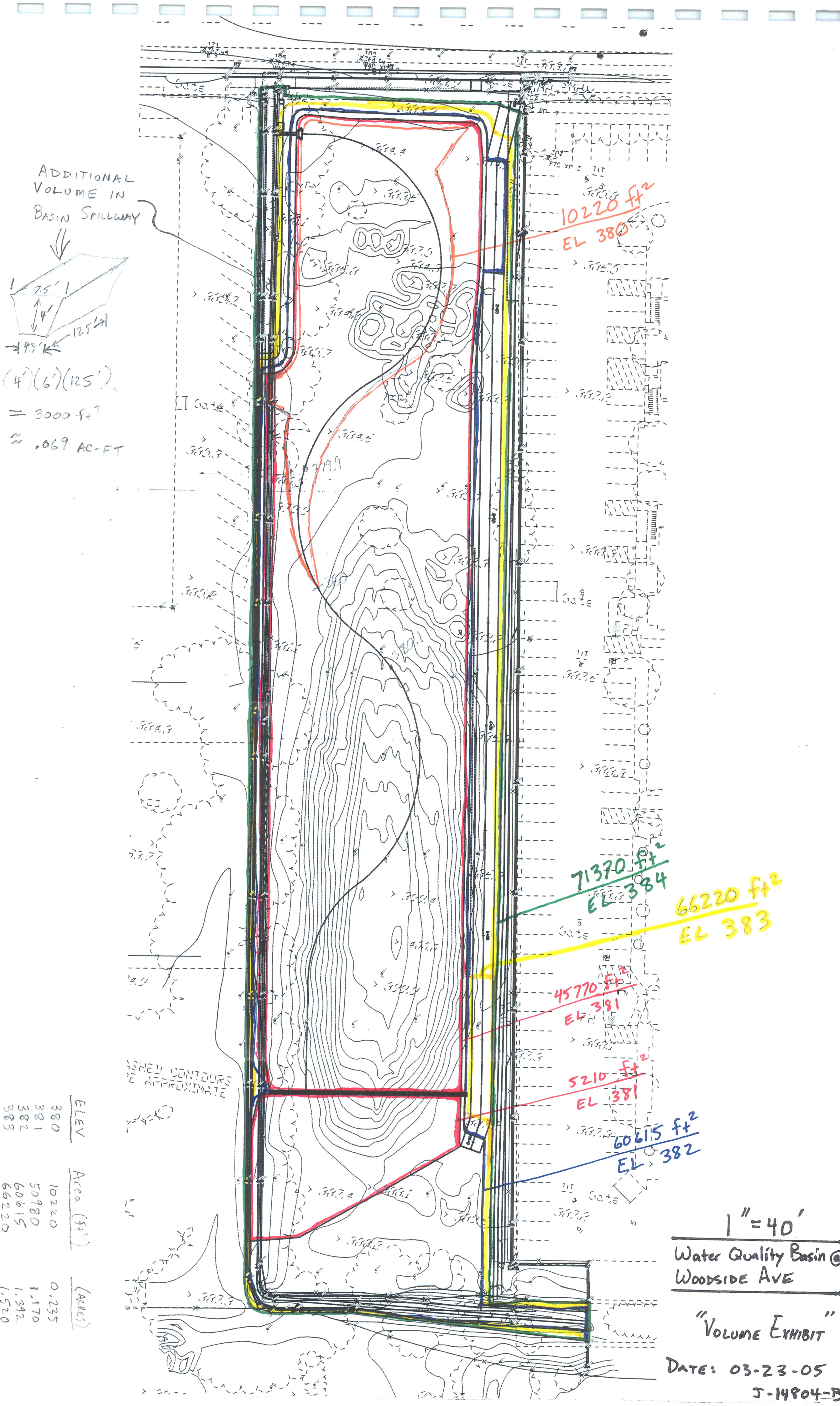
IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))**2

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

ALSO – FOR HEC-1

385 = 5.23 AC-FT + 1.579 + .02 = 6.83 AC-FT

386 = 6.83 + 1.579 = 8.41 AC-FT



ELEV	Area (ft²)	(Acres)
380	10220	0.235
381	50980	1.170
382	60615	1.392
383	66220	1.520
384	71370	1.638

APPENDIX D

Drawdown Time Calculation

For

Water Quality Volume

DRAWDOWN TIME (with Low Flow Vertical Orifice):

Enter information in yellow boxes. All other information is self-generated.

Description of low flow outlet works: 12-inch PVC outlet pipe with Wing-type Headwall. Steel Plates bolted to headwall such that a 2-inch (wide) vertical notch extends vertically 10-inches from the flowline of the pipe.

	inches	feet	Radius	
Diameter of **Outlet Pipe**, D (in.):	12	1	0.5	ft
Height of Weir, Hd (ft.):	10-inch max	0.833		
Width of Weir, L (in.):	2			
Invert Elevation, Z (ft):	379.5			
Step Increments for Drawdown Time (min):	10			

0.6 Orifice; $A_{orifice}$ = ; $Q_{orifice}$ = CA(2gHo)0.5

Based on Rating Curve: EL@V_{REM} = y = -7E-11x2 + 3E-05x + 380

Water Surface Elevation, E	Volume, V (ft^3)	C	Area, A (ft^2)	Head, H_o (ft)	Discharge, Q_{OUT} (cfs)	Duration, T (min)	Volume Out, V_{OUT} (ft^3)	Volume Remaining, V_{REM} (ft^3)	Elevation at V_{REM}	Total Drawdown Time, T_{TOT} (hours)
383.10	155509	0.6	0.14	3.18	1.19	10	716	154793	382.97	0.17
382.97	154793	0.6	0.14	3.05	1.17	10	701	154092	382.96	0.33
382.96	154092	0.6	0.14	3.04	1.17	10	700	153392	382.95	0.50
382.95	153392	0.6	0.14	3.04	1.17	10	699	152693	382.95	0.67
382.95	152693	0.6	0.14	3.03	1.16	10	699	151994	382.94	0.83
382.94	151994	0.6	0.14	3.03	1.16	10	698	151296	382.94	1.00
382.94	151296	0.6	0.14	3.02	1.16	10	697	150599	382.93	1.17
382.93	150599	0.6	0.14	3.01	1.16	10	697	149902	382.92	1.33
382.92	149902	0.6	0.14	3.01	1.16	10	696	149207	382.92	1.50
382.92	149207	0.6	0.14	3.00	1.16	10	695	148511	382.91	1.67
382.91	148511	0.6	0.14	2.99	1.16	10	694	147817	382.91	1.83
382.91	147817	0.6	0.14	2.99	1.16	10	694	147123	382.90	2.00
382.90	147123	0.6	0.14	2.98	1.15	10	693	146431	382.89	2.17
382.89	146431	0.6	0.14	2.98	1.15	10	692	145738	382.89	2.33
382.89	145738	0.6	0.14	2.97	1.15	10	691	145047	382.88	2.50
382.88	145047	0.6	0.14	2.96	1.15	10	691	144357	382.87	2.67
382.87	144357	0.6	0.14	2.96	1.15	10	690	143667	382.87	2.83
382.87	143667	0.6	0.14	2.95	1.15	10	689	142978	382.86	3.00
382.86	142978	0.6	0.14	2.94	1.15	10	688	142290	382.85	3.17
382.85	142290	0.6	0.14	2.93	1.15	10	687	141602	382.84	3.33
382.84	141602	0.6	0.14	2.93	1.14	10	687	140916	382.84	3.50
382.84	140916	0.6	0.14	2.92	1.14	10	686	140230	382.83	3.67
382.83	140230	0.6	0.14	2.91	1.14	10	685	139545	382.82	3.83
382.82	139545	0.6	0.14	2.91	1.14	10	684	138861	382.82	4.00
382.82	138861	0.6	0.14	2.90	1.14	10	683	138178	382.81	4.17
382.81	138178	0.6	0.14	2.89	1.14	10	682	137495	382.80	4.33
382.80	137495	0.6	0.14	2.88	1.14	10	682	136814	382.79	4.50
382.79	136814	0.6	0.14	2.88	1.13	10	681	136133	382.79	4.67
382.79	136133	0.6	0.14	2.87	1.13	10	680	135453	382.78	4.83
382.78	135453	0.6	0.14	2.86	1.13	10	679	134774	382.77	5.00
382.77	134774	0.6	0.14	2.86	1.13	10	678	134096	382.76	5.17
382.76	134096	0.6	0.14	2.85	1.13	10	677	133419	382.76	5.33
382.76	133419	0.6	0.14	2.84	1.13	10	676	132743	382.75	5.50
382.75	132743	0.6	0.14	2.83	1.13	10	675	132068	382.74	5.67
382.74	132068	0.6	0.14	2.82	1.12	10	674	131394	382.73	5.83
382.73	131394	0.6	0.14	2.82	1.12	10	673	130720	382.73	6.00
382.73	130720	0.6	0.14	2.81	1.12	10	672	130048	382.72	6.17
382.72	130048	0.6	0.14	2.80	1.12	10	672	129376	382.71	6.33
382.71	129376	0.6	0.14	2.79	1.12	10	671	128706	382.70	6.50
382.70	128706	0.6	0.14	2.78	1.12	10	670	128036	382.69	6.67
382.69	128036	0.6	0.14	2.78	1.11	10	669	127367	382.69	6.83
382.69	127367	0.6	0.14	2.77	1.11	10	668	126700	382.68	7.00
382.68	126700	0.6	0.14	2.76	1.11	10	667	126033	382.67	7.17
382.67	126033	0.6	0.14	2.75	1.11	10	666	125367	382.66	7.33
382.66	125367	0.6	0.14	2.74	1.11	10	665	124703	382.65	7.50

Water Surface Elevation, E	Volume, V (ft^3)	C	Area, A (ft^2)	Head, H_o (ft)	Discharge, Q_{OUT} (cfs)	Duration, T (min)	Volume Out, V_{OUT} (ft^3)	Volume Remaining, V_{REM} (ft^3)	Elevation at V_{REM}	Total Drawdown Time, T_{TOT} (hours)
382.65	124703	0.6	0.14	2.74	1.11	10	664	124039	382.64	7.67
382.64	124039	0.6	0.14	2.73	1.10	10	663	123376	382.64	7.83
382.64	123376	0.6	0.14	2.72	1.10	10	662	122715	382.63	8.00
382.63	122715	0.6	0.14	2.71	1.10	10	661	122054	382.62	8.17
382.62	122054	0.6	0.14	2.70	1.10	10	660	121394	382.61	8.33
382.61	121394	0.6	0.14	2.69	1.10	10	659	120736	382.60	8.50
382.60	120736	0.6	0.14	2.69	1.10	10	657	120078	382.59	8.67
382.59	120078	0.6	0.14	2.68	1.09	10	656	119422	382.58	8.83
382.58	119422	0.6	0.14	2.67	1.09	10	655	118767	382.58	9.00
382.58	118767	0.6	0.14	2.66	1.09	10	654	118112	382.57	9.17
382.57	118112	0.6	0.14	2.65	1.09	10	653	117459	382.56	9.33
382.56	117459	0.6	0.14	2.64	1.09	10	652	116807	382.55	9.50
382.55	116807	0.6	0.14	2.63	1.09	10	651	116156	382.54	9.67
382.54	116156	0.6	0.14	2.62	1.08	10	650	115506	382.53	9.83
382.53	115506	0.6	0.14	2.61	1.08	10	649	114857	382.52	10.00
382.52	114857	0.6	0.14	2.61	1.08	10	648	114210	382.51	10.17
382.51	114210	0.6	0.14	2.60	1.08	10	647	113563	382.50	10.33
382.50	113563	0.6	0.14	2.59	1.08	10	645	112918	382.50	10.50
382.50	112918	0.6	0.14	2.58	1.07	10	644	112273	382.49	10.67
382.49	112273	0.6	0.14	2.57	1.07	10	643	111630	382.48	10.83
382.48	111630	0.6	0.14	2.56	1.07	10	642	110988	382.47	11.00
382.47	110988	0.6	0.14	2.55	1.07	10	641	110347	382.46	11.17
382.46	110347	0.6	0.14	2.54	1.07	10	640	109708	382.45	11.33
382.45	109708	0.6	0.14	2.53	1.06	10	638	109069	382.44	11.50
382.44	109069	0.6	0.14	2.52	1.06	10	637	108432	382.43	11.67
382.43	108432	0.6	0.14	2.51	1.06	10	636	107796	382.42	11.83
382.42	107796	0.6	0.14	2.50	1.06	10	635	107161	382.41	12.00
382.41	107161	0.6	0.14	2.49	1.06	10	634	106527	382.40	12.17
382.40	106527	0.6	0.14	2.48	1.05	10	632	105895	382.39	12.33
382.39	105895	0.6	0.14	2.48	1.05	10	631	105263	382.38	12.50
382.38	105263	0.6	0.14	2.47	1.05	10	630	104633	382.37	12.67
382.37	104633	0.6	0.14	2.46	1.05	10	629	104005	382.36	12.83
382.36	104005	0.6	0.14	2.45	1.05	10	628	103377	382.35	13.00
382.35	103377	0.6	0.14	2.44	1.04	10	626	102751	382.34	13.17
382.34	102751	0.6	0.14	2.43	1.04	10	625	102126	382.33	13.33
382.33	102126	0.6	0.14	2.42	1.04	10	624	101502	382.32	13.50
382.32	101502	0.6	0.14	2.41	1.04	10	623	100879	382.31	13.67
382.31	100879	0.6	0.14	2.40	1.04	10	621	100258	382.30	13.83
382.30	100258	0.6	0.14	2.39	1.03	10	620	99638	382.29	14.00
382.29	99638	0.6	0.14	2.38	1.03	10	619	99019	382.28	14.17
382.28	99019	0.6	0.14	2.37	1.03	10	617	98402	382.27	14.33
382.27	98402	0.6	0.14	2.36	1.03	10	616	97786	382.26	14.50
382.26	97786	0.6	0.14	2.35	1.02	10	615	97171	382.25	14.67
382.25	97171	0.6	0.14	2.34	1.02	10	613	96558	382.24	14.83
382.24	96558	0.6	0.14	2.33	1.02	10	612	95945	382.23	15.00

Water Surface Elevation, E	Volume, V (ft^3)	C	Area, A (ft^2)	Head, H_o (ft)	Discharge, Q_{OUT} (cfs)	Duration, T (min)	Volume Out, V_{OUT} (ft^3)	Volume Remaining, V_{REM} (ft^3)	Elevation at V_{REM}	Total Drawdown Time, T_{TOT} (hours)
382.23	95945	0.6	0.14	2.32	1.02	10	611	95335	382.22	15.17
382.22	95335	0.6	0.14	2.31	1.02	10	609	94725	382.21	15.33
382.21	94725	0.6	0.14	2.30	1.01	10	608	94117	382.20	15.50
382.20	94117	0.6	0.14	2.29	1.01	10	607	93510	382.19	15.67
382.19	93510	0.6	0.14	2.28	1.01	10	605	92905	382.18	15.83
382.18	92905	0.6	0.14	2.27	1.01	10	604	92301	382.17	16.00
382.17	92301	0.6	0.14	2.26	1.00	10	603	91698	382.16	16.17
382.16	91698	0.6	0.14	2.25	1.00	10	601	91097	382.15	16.33
382.15	91097	0.6	0.14	2.24	1.00	10	600	90497	382.14	16.50
382.14	90497	0.6	0.14	2.22	1.00	10	599	89898	382.13	16.67
382.13	89898	0.6	0.14	2.21	1.00	10	597	89301	382.12	16.83
382.12	89301	0.6	0.14	2.20	0.99	10	596	88706	382.11	17.00
382.11	88706	0.6	0.14	2.19	0.99	10	594	88111	382.10	17.17
382.10	88111	0.6	0.14	2.18	0.99	10	593	87518	382.09	17.33
382.09	87518	0.6	0.14	2.17	0.99	10	591	86927	382.08	17.50
382.08	86927	0.6	0.14	2.16	0.98	10	590	86337	382.07	17.67
382.07	86337	0.6	0.14	2.15	0.98	10	589	85748	382.06	17.83
382.06	85748	0.6	0.14	2.14	0.98	10	587	85161	382.05	18.00
382.05	85161	0.6	0.14	2.13	0.98	10	586	84576	382.04	18.17
382.04	84576	0.6	0.14	2.12	0.97	10	584	83991	382.03	18.33
382.03	83991	0.6	0.14	2.11	0.97	10	583	83409	382.02	18.50
382.02	83409	0.6	0.14	2.10	0.97	10	581	82827	382.00	18.67
382.00	82827	0.6	0.14	2.09	0.97	10	580	82248	381.99	18.83
381.99	82248	0.6	0.14	2.08	0.96	10	578	81669	381.98	19.00
381.98	81669	0.6	0.14	2.07	0.96	10	577	81092	381.97	19.17
381.97	81092	0.6	0.14	2.06	0.96	10	575	80517	381.96	19.33
381.96	80517	0.6	0.14	2.05	0.96	10	574	79943	381.95	19.50
381.95	79943	0.6	0.14	2.03	0.95	10	572	79371	381.94	19.67
381.94	79371	0.6	0.14	2.02	0.95	10	571	78800	381.93	19.83
381.93	78800	0.6	0.14	2.01	0.95	10	569	78231	381.92	20.00
381.92	78231	0.6	0.14	2.00	0.95	10	568	77663	381.91	20.17
381.91	77663	0.6	0.14	1.99	0.94	10	566	77097	381.90	20.33
381.90	77097	0.6	0.14	1.98	0.94	10	565	76532	381.89	20.50
381.89	76532	0.6	0.14	1.97	0.94	10	563	75969	381.88	20.67
381.88	75969	0.6	0.14	1.96	0.94	10	562	75408	381.86	20.83
381.86	75408	0.6	0.14	1.95	0.93	10	560	74848	381.85	21.00
381.85	74848	0.6	0.14	1.94	0.93	10	558	74290	381.84	21.17
381.84	74290	0.6	0.14	1.93	0.93	10	557	73733	381.83	21.33
381.83	73733	0.6	0.14	1.91	0.93	10	555	73178	381.82	21.50
381.82	73178	0.6	0.14	1.90	0.92	10	554	72624	381.81	21.67
381.81	72624	0.6	0.14	1.89	0.92	10	552	72072	381.80	21.83
381.80	72072	0.6	0.14	1.88	0.92	10	550	71521	381.79	22.00
381.79	71521	0.6	0.14	1.87	0.91	10	549	70973	381.78	22.17
381.78	70973	0.6	0.14	1.86	0.91	10	547	70425	381.77	22.33
381.77	70425	0.6	0.14	1.85	0.91	10	546	69880	381.75	22.50
381.75	69880	0.6	0.14	1.84	0.91	10	544	69336	381.74	22.67
381.74	69336	0.6	0.14	1.83	0.90	10	542	68793	381.73	22.83
381.73	68793	0.6	0.14	1.82	0.90	10	541	68253	381.72	23.00
381.72	68253	0.6	0.14	1.80	0.90	10	539	67714	381.71	23.17
381.71	67714	0.6	0.14	1.79	0.90	10	537	67176	381.70	23.33
381.70	67176	0.6	0.14	1.78	0.89	10	536	66641	381.69	23.50
381.69	66641	0.6	0.14	1.77	0.89	10	534	66106	381.68	23.67
381.68	66106	0.6	0.14	1.76	0.89	10	532	65574	381.67	23.83
381.67	65574	0.6	0.14	1.75	0.88	10	531	65043	381.66	24.00
381.66	65043	0.6	0.14	1.74	0.88	10	529	64514	381.64	24.17
381.64	64514	0.6	0.14	1.73	0.88	10	527	63987	381.63	24.33
381.63	63987	0.6	0.14	1.72	0.88	10	526	63461	381.62	24.50
381.62	63461	0.6	0.14	1.71	0.87	10	524	62937	381.61	24.67
381.61	62937	0.6	0.14	1.69	0.87	10	522	62415	381.60	24.83

50 % of Total Water Quality Vol. discharges in ≈ 20 HRS

← At 24 HRS, 58 % of WQv has drained out

Water Surface Elevation, E	Volume, V (ft^3)	C	Area, A (ft^2)	Head, H_o (ft)	Discharge, Q_{OUT} (cfs)	Duration, T (min)	Volume Out, V_{OUT} (ft^3)	Volume Remaining, V_{REM} (ft^3)	Elevation at V_{REM}	Total Drawdown Time, T_{TOT} (hours)
381.60	62415	0.6	0.14	1.68	0.87	10	521	61894	381.59	25.00
381.59	61894	0.6	0.14	1.67	0.86	10	519	61376	381.58	25.17
381.58	61376	0.6	0.14	1.66	0.86	10	517	60858	381.57	25.33
381.57	60858	0.6	0.14	1.65	0.86	10	515	60343	381.56	25.50
381.56	60343	0.6	0.14	1.64	0.86	10	514	59829	381.54	25.67
381.54	59829	0.6	0.14	1.63	0.85	10	512	59318	381.53	25.83
381.53	59318	0.6	0.14	1.62	0.85	10	510	58807	381.52	26.00
381.52	58807	0.6	0.14	1.61	0.85	10	508	58299	381.51	26.17
381.51	58299	0.6	0.14	1.59	0.84	10	507	57792	381.50	26.33
381.50	57792	0.6	0.14	1.58	0.84	10	505	57287	381.49	26.50
381.49	57287	0.6	0.14	1.57	0.84	10	503	56784	381.48	26.67
381.48	56784	0.6	0.14	1.56	0.84	10	501	56283	381.47	26.83
381.47	56283	0.6	0.14	1.55	0.83	10	500	55783	381.46	27.00
381.46	55783	0.6	0.14	1.54	0.83	10	498	55286	381.44	27.17
381.44	55286	0.6	0.14	1.53	0.83	10	496	54790	381.43	27.33
381.43	54790	0.6	0.14	1.52	0.82	10	494	54295	381.42	27.50
381.42	54295	0.6	0.14	1.51	0.82	10	492	53803	381.41	27.67
381.41	53803	0.6	0.14	1.49	0.82	10	491	53313	381.40	27.83
381.40	53313	0.6	0.14	1.48	0.81	10	489	52824	381.39	28.00
381.39	52824	0.6	0.14	1.47	0.81	10	487	52337	381.38	28.17
381.38	52337	0.6	0.14	1.46	0.81	10	485	51852	381.37	28.33
381.37	51852	0.6	0.14	1.45	0.81	10	483	51368	381.36	28.50
381.36	51368	0.6	0.14	1.44	0.80	10	481	50887	381.35	28.67
381.35	50887	0.6	0.14	1.43	0.80	10	480	50407	381.33	28.83
381.33	50407	0.6	0.14	1.42	0.80	10	478	49930	381.32	29.00
381.32	49930	0.6	0.14	1.41	0.79	10	476	49454	381.31	29.17
381.31	49454	0.6	0.14	1.40	0.79	10	474	48980	381.30	29.33
381.30	48980	0.6	0.14	1.38	0.79	10	472	48508	381.29	29.50
381.29	48508	0.6	0.14	1.37	0.78	10	470	48037	381.28	29.67
381.28	48037	0.6	0.14	1.36	0.78	10	468	47569	381.27	29.83
381.27	47569	0.6	0.14	1.35	0.78	10	467	47102	381.26	30.00
381.26	47102	0.6	0.14	1.34	0.77	10	465	46638	381.25	30.17
381.25	46638	0.6	0.14	1.33	0.77	10	463	46175	381.24	30.33
381.24	46175	0.6	0.14	1.32	0.77	10	461	45714	381.23	30.50
381.23	45714	0.6	0.14	1.31	0.76	10	459	45255	381.21	30.67
381.21	45255	0.6	0.14	1.30	0.76	10	457	44798	381.20	30.83
381.20	44798	0.6	0.14	1.29	0.76	10	455	44343	381.19	31.00
381.19	44343	0.6	0.14	1.28	0.76	10	453	43889	381.18	31.17
381.18	43889	0.6	0.14	1.27	0.75	10	451	43438	381.17	31.33
381.17	43438	0.6	0.14	1.25	0.75	10	449	42989	381.16	31.50
381.16	42989	0.6	0.14	1.24	0.75	10	447	42541	381.15	31.67
381.15	42541	0.6	0.14	1.23	0.74	10	446	42096	381.14	31.83
381.14	42096	0.6	0.14	1.22	0.74	10	444	41652	381.13	32.00
381.13	41652	0.6	0.14	1.21	0.74	10	442	41210	381.12	32.17
381.12	41210	0.6	0.14	1.20	0.73	10	440	40771	381.11	32.33
381.11	40771	0.6	0.14	1.19	0.73	10	438	40333	381.10	32.50
381.10	40333	0.6	0.14	1.18	0.73	10	436	39897	381.09	32.67
381.09	39897	0.6	0.14	1.17	0.72	10	434	39464	381.07	32.83

Water Surface Elevation, E	Volume, V (ft^3)	C	Area, A (ft^2)	Head, H_o (ft)	Discharge, Q_{OUT} (cfs)	Duration, T (min)	Volume Out, V_{OUT} (ft^3)	Volume Remaining, V_{REM} (ft^3)	Elevation at V_{REM}	Total Drawdown Time, T_{TOT} (hours)
381.07	39464	0.6	0.14	1.16	0.72	10	432	39032	381.06	33.00
381.06	39032	0.6	0.14	1.15	0.72	10	430	38602	381.05	33.17
381.05	38602	0.6	0.14	1.14	0.71	10	428	38174	381.04	33.33
381.04	38174	0.6	0.14	1.13	0.71	10	426	37748	381.03	33.50
381.03	37748	0.6	0.14	1.12	0.71	10	424	37324	381.02	33.67
381.02	37324	0.6	0.14	1.11	0.70	10	422	36902	381.01	33.83
381.01	36902	0.6	0.14	1.10	0.70	10	420	36482	381.00	34.00
381.00	36482	0.6	0.14	1.08	0.70	10	418	36065	380.99	34.17
380.99	36065	0.6	0.14	1.07	0.69	10	416	35649	380.98	34.33
380.98	35649	0.6	0.14	1.06	0.69	10	414	35235	380.97	34.50
380.97	35235	0.6	0.14	1.05	0.69	10	412	34823	380.96	34.67
380.96	34823	0.6	0.14	1.04	0.68	10	410	34413	380.95	34.83
380.95	34413	0.6	0.14	1.03	0.68	10	408	34005	380.94	35.00
380.94	34005	0.6	0.14	1.02	0.68	10	406	33600	380.93	35.17
380.93	33600	0.6	0.14	1.01	0.67	10	404	33196	380.92	35.33
380.92	33196	0.6	0.14	1.00	0.67	10	402	32794	380.91	35.50
380.91	32794	0.6	0.14	0.99	0.67	10	400	32395	380.90	35.67
380.90	32395	0.6	0.14	0.98	0.66	10	398	31997	380.89	35.83
380.89	31997	0.6	0.14	0.97	0.66	10	396	31602	380.88	36.00
380.88	31602	0.6	0.14	0.96	0.66	10	393	31208	380.87	36.17
380.87	31208	0.6	0.14	0.95	0.65	10	391	30817	380.86	36.33
380.86	30817	0.6	0.14	0.94	0.65	10	389	30427	380.85	36.50
380.85	30427	0.6	0.14	0.93	0.65	10	387	30040	380.84	36.67
380.84	30040	0.6	0.14	0.92	0.64	10	385	29655	380.83	36.83
380.83	29655	0.6	0.14	0.91	0.64	10	383	29272	380.82	37.00
380.82	29272	0.6	0.14	0.90	0.63	10	381	28891	380.81	37.17
380.81	28891	0.6	0.14	0.89	0.63	10	379	28512	380.80	37.33
380.80	28512	0.6	0.14	0.88	0.63	10	377	28135	380.79	37.50
380.79	28135	0.6	0.14	0.87	0.62	10	375	27761	380.78	37.67
380.78	27761	0.6	0.14	0.86	0.62	10	373	27388	380.77	37.83
380.77	27388	0.6	0.14	0.85	0.62	10	370	27018	380.76	38.00
380.76	27018	0.6	0.14	0.84	0.61	10	368	26649	380.75	38.17
380.75	26649	0.6	0.14	0.83	0.61	10	366	26283	380.74	38.33
380.74	26283	0.6	0.14	0.82	0.61	10	364	25919	380.73	38.50
380.73	25919	0.6	0.14	0.81	0.60	10	362	25557	380.72	38.67
380.72	25557	0.6	0.14	0.80	0.60	10	360	25197	380.71	38.83
380.71	25197	0.6	0.14	0.79	0.60	10	358	24839	380.70	39.00
380.70	24839	0.6	0.14	0.79	0.59	10	356	24484	380.69	39.17
380.69	24484	0.6	0.14	0.78	0.59	10	353	24130	380.68	39.33
380.68	24130	0.6	0.14	0.77	0.59	10	351	23779	380.67	39.50
380.67	23779	0.6	0.14	0.76	0.58	10	349	23430	380.66	39.67
380.66	23430	0.6	0.14	0.75	0.58	10	347	23083	380.66	39.83
380.66	23083	0.6	0.14	0.74	0.57	10	345	22738	380.65	40.00
380.65	22738	0.6	0.14	0.73	0.57	10	343	22395	380.64	40.17
380.64	22395	0.6	0.14	0.72	0.57	10	340	22055	380.63	40.33
380.63	22055	0.6	0.14	0.71	0.56	10	338	21717	380.62	40.50
380.62	21717	0.6	0.14	0.70	0.56	10	336	21380	380.61	40.67
380.61	21380	0.6	0.14	0.69	0.56	10	334	21047	380.60	40.83
380.60	21047	0.6	0.14	0.68	0.55	10	332	20715	380.59	41.00
380.59	20715	0.6	0.14	0.67	0.55	10	330	20385	380.58	41.17
380.58	20385	0.6	0.14	0.67	0.55	10	327	20058	380.57	41.33
380.57	20058	0.6	0.14	0.66	0.54	10	325	19733	380.56	41.50
380.56	19733	0.6	0.14	0.65	0.54	10	323	19410	380.56	41.67
380.56	19410	0.6	0.14	0.64	0.53	10	321	19089	380.55	41.83
380.55	19089	0.6	0.14	0.63	0.53	10	319	18770	380.54	42.00
380.54	18770	0.6	0.14	0.62	0.53	10	316	18454	380.53	42.17
380.53	18454	0.6	0.14	0.61	0.52	10	314	18140	380.52	42.33
380.52	18140	0.6	0.14	0.60	0.52	10	312	17828	380.51	42.50
380.51	17828	0.6	0.14	0.60	0.52	10	310	17518	380.50	42.67
380.50	17518	0.6	0.14	0.59	0.51	10	308	17210	380.50	42.83
380.50	17210	0.6	0.14	0.58	0.51	10	305	16905	380.49	43.00

Water Surface Elevation, E	Volume, V (ft^3)	C	Area, A (ft^2)	Head, H_o (ft)	Discharge, Q_{OUT} (cfs)	Duration, T (min)	Volume Out, V_{OUT} (ft^3)	Volume Remaining, V_{REM} (ft^3)	Elevation at V_{REM}	Total Drawdown Time, T_{TOT} (hours)
380.49	16905	0.6	0.14	0.57	0.51	10	303	16602	380.48	43.17
380.48	16602	0.6	0.14	0.56	0.50	10	301	16301	380.47	43.33
380.47	16301	0.6	0.14	0.55	0.50	10	299	16003	380.46	43.50
380.46	16003	0.6	0.14	0.55	0.49	10	296	15706	380.45	43.67
380.45	15706	0.6	0.14	0.54	0.49	10	294	15412	380.45	43.83
380.45	15412	0.6	0.14	0.53	0.49	10	292	15120	380.44	44.00
380.44	15120	0.6	0.14	0.52	0.48	10	290	14831	380.43	44.17
380.43	14831	0.6	0.14	0.51	0.48	10	287	14543	380.42	44.33
380.42	14543	0.6	0.14	0.50	0.48	10	285	14258	380.41	44.50
380.41	14258	0.6	0.14	0.50	0.47	10	283	13975	380.41	44.67
380.41	13975	0.6	0.14	0.49	0.47	10	281	13695	380.40	44.83
380.40	13695	0.6	0.14	0.48	0.46	10	278	13416	380.39	45.00
380.39	13416	0.6	0.14	0.47	0.46	10	276	13140	380.38	45.17
380.38	13140	0.6	0.14	0.47	0.46	10	274	12867	380.37	45.33
380.37	12867	0.6	0.14	0.46	0.45	10	271	12595	380.37	45.50
380.37	12595	0.6	0.14	0.45	0.45	10	269	12326	380.36	45.67
380.36	12326	0.6	0.14	0.44	0.44	10	267	12059	380.35	45.83
380.35	12059	0.6	0.14	0.43	0.44	10	265	11795	380.34	46.00
380.34	11795	0.6	0.14	0.43	0.44	10	262	11532	380.34	46.17
380.34	11532	0.6	0.14	0.42	0.43	10	260	11272	380.33	46.33
380.33	11272	0.6	0.14	0.42	0.43	10	258	11014	380.32	46.50
380.32	11014	0.6	0.14	0.41	0.42	10	255	10759	380.31	46.67
380.31	10759	0.6	0.14	0.41	0.42	10	251	10508	380.31	46.83
380.31	10508	0.6	0.13	0.41	0.41	10	248	10259	380.30	47.00
380.30	10259	0.6	0.13	0.40	0.41	10	245	10015	380.29	47.17
380.29	10015	0.6	0.13	0.40	0.40	10	242	9773	380.29	47.33
380.29	9773	0.6	0.13	0.40	0.40	10	239	9534	380.28	47.50
380.28	9534	0.6	0.13	0.39	0.39	10	235	9299	380.27	47.67
380.27	9299	0.6	0.13	0.39	0.39	10	232	9067	380.27	47.83
380.27	9067	0.6	0.13	0.39	0.38	10	229	8837	380.26	48.00
380.26	8837	0.6	0.13	0.38	0.38	10	226	8611	380.25	48.17
380.25	8611	0.6	0.13	0.38	0.37	10	223	8387	380.25	48.33
380.25	8387	0.6	0.12	0.38	0.37	10	221	8167	380.24	48.50
380.24	8167	0.6	0.12	0.37	0.36	10	218	7949	380.23	48.67
380.23	7949	0.6	0.12	0.37	0.36	10	215	7734	380.23	48.83
380.23	7734	0.6	0.12	0.37	0.35	10	212	7522	380.22	49.00
380.22	7522	0.6	0.12	0.36	0.35	10	210	7312	380.22	49.17
380.22	7312	0.6	0.12	0.36	0.34	10	207	7105	380.21	49.33
380.21	7105	0.6	0.12	0.36	0.34	10	204	6901	380.20	49.50
380.20	6901	0.6	0.12	0.35	0.34	10	202	6699	380.20	49.67
380.20	6699	0.6	0.12	0.35	0.33	10	199	6499	380.19	49.83
380.19	6499	0.6	0.12	0.35	0.33	10	197	6303	380.19	50.00
380.19	6303	0.6	0.11	0.35	0.32	10	194	6108	380.18	50.17
380.18	6108	0.6	0.11	0.34	0.32	10	192	5916	380.18	50.33
380.18	5916	0.6	0.11	0.34	0.32	10	190	5727	380.17	50.50
380.17	5727	0.6	0.11	0.34	0.31	10	187	5539	380.16	50.67
380.16	5539	0.6	0.11	0.33	0.31	10	185	5354	380.16	50.83
380.16	5354	0.6	0.11	0.33	0.30	10	183	5172	380.15	51.00
380.15	5172	0.6	0.11	0.33	0.30	10	181	4991	380.15	51.17
380.15	4991	0.6	0.11	0.33	0.30	10	178	4813	380.14	51.33
380.14	4813	0.6	0.11	0.32	0.29	10	176	4637	380.14	51.50
380.14	4637	0.6	0.11	0.32	0.29	10	174	4463	380.13	51.67
380.13	4463	0.6	0.11	0.32	0.29	10	172	4291	380.13	51.83
380.13	4291	0.6	0.10	0.32	0.28	10	170	4121	380.12	52.00
380.12	4121	0.6	0.10	0.31	0.28	10	168	3953	380.12	52.17
380.12	3953	0.6	0.10	0.31	0.28	10	166	3787	380.11	52.33
380.11	3787	0.6	0.10	0.31	0.27	10	164	3623	380.11	52.50
380.11	3623	0.6	0.10	0.31	0.27	10	162	3461	380.10	52.67
380.10	3461	0.6	0.10	0.30	0.27	10	160	3301	380.10	52.83
380.10	3301	0.6	0.10	0.30	0.26	10	158	3143	380.09	53.00
380,09	3143	0.6	0.10	0.30	0.26	10	156	2987	380.09	53.17

Water Surface Elevation, E	Volume, V (ft^3)	C	Area, A (ft^2)	Head, H_o (ft)	Discharge, Q_{OUT} (cfs)	Duration, T (min)	Volume Out, V_{OUT} (ft^3)	Volume Remaining, V_{REM} (ft^3)	Elevation at V_{REM}	Total Drawdown Time, T_{TOT} (hours)
380.09	2987	0.6	0.10	0.30	0.26	10	154	2832	380.08	53.33
380.08	2832	0.6	0.10	0.29	0.25	10	153	2679	380.08	53.50
380.08	2679	0.6	0.10	0.29	0.25	10	151	2529	380.08	53.67
380.08	2529	0.6	0.10	0.29	0.25	10	149	2379	380.07	53.83
380.07	2379	0.6	0.10	0.29	0.25	10	147	2232	380.07	54.00
380.07	2232	0.6	0.09	0.29	0.24	10	146	2086	380.06	54.17
380.06	2086	0.6	0.09	0.28	0.24	10	144	1942	380.06	54.33
380.06	1942	0.6	0.09	0.28	0.24	10	142	1800	380.05	54.50
380.05	1800	0.6	0.09	0.28	0.23	10	141	1659	380.05	54.67
380.05	1659	0.6	0.09	0.28	0.23	10	139	1519	380.05	54.83
380.05	1519	0.6	0.09	0.27	0.23	10	138	1382	380.04	55.00
380.04	1382	0.6	0.09	0.27	0.23	10	136	1246	380.04	55.17
380.04	1246	0.6	0.09	0.27	0.22	10	135	1111	380.03	55.33
380.03	1111	0.6	0.09	0.27	0.22	10	133	978	380.03	55.50
380.03	978	0.6	0.09	0.27	0.22	10	132	846	380.03	55.67
380.03	846	0.6	0.09	0.26	0.22	10	130	716	380.02	55.83
380.02	716	0.6	0.09	0.26	0.21	10	129	588	380.02	56.00
380.02	588	0.6	0.09	0.26	0.21	10	127	460	380.01	56.17
380.01	460	0.6	0.09	0.26	0.21	10	126	335	380.01	56.33
380.01	335	0.6	0.09	0.26	0.21	10	124	210	380.01	56.50
380.01	210	0.6	0.08	0.26	0.21	10	123	87	380.00	56.67
380.00	87	0.6	0.08	0.25	0.20	10	122	-35	380.00	56.83
380.00	-35	0.6	0.08	0.25	0.20	10	120	-155	380.00	57.00
380.00	-155	0.6	0.08	0.25	0.20	10	119	-274	379.99	57.17
379.99	-274	0.6	0.08	0.25	0.20	10	118	-392	379.99	57.33

Drawdown Duration from EL 383.1 to EL 380.0

$\boxed{\text{TOTAL DRAWDOWN TIME IS} \approx 61.5 \text{ HRS}}$

Q_{OUT} at EL 380 = 0.20 cfs

∴ AVG Q_{OUT} from EL 380 to EL 379.5 ≈ 0.10 cfs

∴ DURATION from " "

is $= \left[(\text{VOL at EL } 380) / (0.10 \text{ cfs}) \right] \times \left(\frac{1 \text{ HR}}{3600 \text{ s}} \right)$

$= 1699 \text{ ft}^3$

$= 4.7$ HRS

$(56.75) + (4.7) = 61.5$ HRS

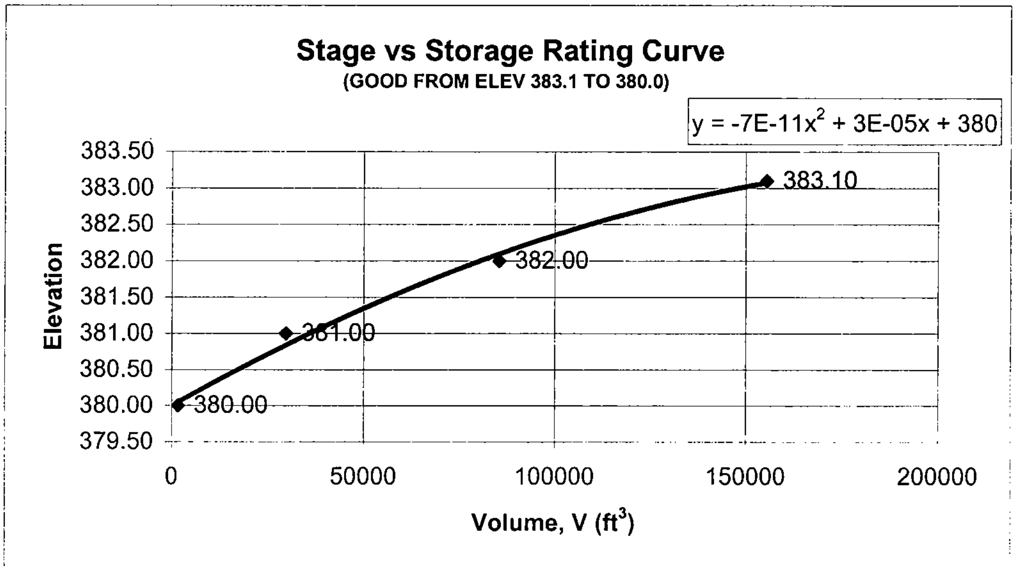
Stage vs Storage Rating Curve:

Support Information for creating a Stage vs. Storage Rating Curve.
An equation can be determined from the relationship, which is then used as part of the Drawdown Time computation.

Known elevations and volumes (from Pondpack):

Water Surface Elevation, E	Volume, V (ac-ft)	Volume, V (ft^3)
379.50	0.000	0
380.00	0.039	1699
381.00	0.682	29708
382.00	1.962	85465
383.10	3.570	155509

Plot of known values, with best-fit trendline and equation:



APPENDIX E

Detention Analyses Computer Outputs

```
*****************************************                               ***************************************
*                                       *                               *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                               *  U.S. ARMY CORPS OF ENGINEERS       *
*            JUN   1998                 *                               *  HYDROLOGIC ENGINEERING CENTER      *
*          VERSION 4.1                  *                               *        609 SECOND STREET            *
*                                       *                               *     DAVIS, CALIFORNIA 95616         *
* RUN DATE   20APR05  TIME  13:40:29    *                               *         (916) 756-1104              *
*                                       *                               *                                     *
*****************************************                               ***************************************


                                        X     X  XXXXXXX   XXXXX          X
                                        X     X  X        X     X        XX
                                        X     X  X        X               X
                                        XXXXXXX  XXXX     X       XXXXX   X
                                        X     X  X        X               X
                                        X     X  X        X     X         X
                                        X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

*** FREE ***
              *DIAGRAM

              ID   ********************************************************************
              ID   WATER QUALITY BASIN AT WOODSIDE AVENUE
              ID   DETENTION ANALYSIS FOR THE PROPOSED CONDITION
              ID   100 YEAR - 6 HOUR STORM EVENT
              ID   DETERMINED INPUT PARAMETERS FROM MDP HYDROLOGIC ANALYSIS
              ID   FNAME: WQBasin.HC1                J-14804B                April 20, 2005
              ID   ********************************************************************
              ID   12-inch PVC outlet pipe with plated front, only 2-inch wide vert notch
              ID   Low-flow outlet works allows flow out from EL 379.5 to EL 383.1
              ID   Basin spillway at EL 383.1 allows flow towards existing two culverts
              ID   Existing two culverts allow outflow of 236 cfs at EL 385
              ID   Overflow of adjacent (western) property and Woodside Ave. at EL 384.1
              ID   ********************************************************************
              IT       1 01JAN90    1200     300
              IO       3

              KK100_bsnB.hc1
              KM   RUN DATE    4/3/2005
              KM   RATIONAL METHOD HYDROGRAPH PROGRAM
              KM   COPYRIGHT 1992, 2001, RICK ENGINEERING COMPANY
              KM   6HR RAINFALL IS  2.67  INCHES
              KM   RATIONAL METHOD RUNOFF COEFFICIENT IS  0.6
              KM   RATIONAL METHOD TIME OF CONCENTRATION IS  20  MIN.
              KM   FOR THIS DATA TO RUN PROPERLY THIS IT CARD MUST BE ADDED TO YOUR HEC-1
              KM   IT 2 01JAN90 1200 200
              BA  1.3885
              IN      20 01JAN90    1150
              QI       0      86    89.3    97.1   101.6   112.7   119.5     137   148.6   181.6
              QI   206.8   303.7   558.1 1403.64   243.6     163   127.5   106.8      93       0
              QI       0       0       0       0       0       0       0       0       0       0

              KK  DETAIN
              KM   DETENTION FOR BASIN
              KO       0       2
              RS       1    STOR      -1
              SV       0    .039    .682    1.96    3.42    3.57    5.23    6.83    8.41
              SQ       0     0.2     0.7    0.97    1.17    1.19     200     236 1403.64
              SE   379.5     380     381     382     383   383.1   384.1     385     386
              ZZ
```

```
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE       (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

  NO.       (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

   17     100_bsnB
                V
                V
   31       DETAIN

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
****************************************                                        *************************************
*                                      *                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *   U.S. ARMY CORPS OF ENGINEERS
*             JUN   1998               *                                        *   HYDROLOGIC ENGINEERING CENTER
*           VERSION 4.1                *                                        *         609 SECOND STREET
*                                      *                                        *      DAVIS, CALIFORNIA 95616
*  RUN DATE   20APR05  TIME  13:40:29  *                                        *          (916) 756-1104
*                                      *                                        *
****************************************                                        *************************************




*** HEC-1 ERROR 1 *** INVALID CARD IDENTIFICATION CODE OR CARD OUT OF SEQUENCE
     CARD NO.    1
                              *********************************************************************
                              WATER QUALITY BASIN AT WOODSIDE AVENUE
                              DETENTION ANALYSIS FOR THE PROPOSED CONDITION
                              100 YEAR - 6 HOUR STORM EVENT
                              DETERMINED INPUT PARAMETERS FROM MDP HYDROLOGIC ANALYSIS
                              FNAME: WQBasin.HC1          J-14804B                April 20, 2005
                              *********************************************************************
                              12-inch PVC outlet pipe with plated front, only 2-inch wide vert notch
                              Low-flow outlet works allows flow out from EL 379.5 to EL 383.1
                              Basin spillway at EL 383.1 allows flow towards existing two culverts
                              Existing two culverts allow outflow of 236 cfs at EL 385
                              Overflow of adjacent (western) property and Woodside Ave. at EL 384.1
                              *********************************************************************

  16 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1JAN90  STARTING DATE
                       ITIME        1200  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1JAN90  ENDING DATE
                      NDTIME        1659  ENDING TIME
                       ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE    4.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA        SQUARE MILES
               PRECIPITATION DEPTH  INCHES
               LENGTH, ELEVATION    FEET
               FLOW                 CUBIC FEET PER SECOND
               STORAGE VOLUME       ACRE-FEET
               SURFACE AREA         ACRES
               TEMPERATURE          DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** **
```

```
          **************
          *            *
 17 KK    *  100_bsnB  *     .hc1
          *            *
          **************
                         RUN DATE   4/3/2005
                         RATIONAL METHOD HYDROGRAPH PROGRAM
                         COPYRIGHT 1992, 2001, RICK ENGINEERING COMPANY
                         6HR RAINFALL IS  2.67  INCHES
                         RATIONAL METHOD RUNOFF COEFFICIENT IS  0.6
                         RATIONAL METHOD TIME OF CONCENTRATION IS  20  MIN.
                         FOR THIS DATA TO RUN PROPERLY THIS IT CARD MUST BE ADDED TO YOUR HEC-1
                         IT 2 01JAN90 1200 200

 27 IN        TIME DATA FOR INPUT TIME SERIES
                    JXMIN          20  TIME INTERVAL IN MINUTES
                   JXDATE      1JAN90  STARTING DATE
                   JXTIME        1150  STARTING TIME

            SUBBASIN RUNOFF DATA

 26 BA        SUBBASIN CHARACTERISTICS
                    TAREA        1.39  SUBBASIN AREA

                                                                        ***

     ***             ***             ***             ***             ***

                      HYDROGRAPH AT STATION 100_bsnB

 PEAK FLOW     TIME                              MAXIMUM AVERAGE FLOW
   (CFS)       (HR)                    6-HR         24-HR        72-HR      4.98-HR
   1404.       4.17         (CFS)      263.          263.         263.         263.
                         (INCHES)     1.462         1.462        1.462        1.462
                          (AC-FT)      108.          108.         108.         108.

                     CUMULATIVE AREA =    1.39 SQ MI

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** **

          **************
          *            *
 31 KK    *   DETAIN   *
          *            *
          **************
                         DETENTION FOR BASIN

 33 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           3  PRINT CONTROL
                    IPLOT           2  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

            HYDROGRAPH ROUTING DATA
```

34 RS	STORAGE ROUTING									
	NSTPS	1	NUMBER OF SUBREACHES							
	ITYP	STOR	TYPE OF INITIAL CONDITION							
	RSVRIC	-1.00	INITIAL CONDITION							
	X	.00	WORKING R AND D COEFFICIENT							
35 SV	STORAGE	.0	.0	.7	2.0	3.4	3.6	5.2	6.8	8.4
36 SQ	DISCHARGE	0.	0.	1.	1.	1.	1.	200.	236.	1404.
37 SE	ELEVATION	379.50	380.00	381.00	382.00	383.00	383.10	384.10	385.00	386.00

***

*** *** *** *** ***

HYDROGRAPH AT STATION DETAIN

PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW		
(CFS)	(HR)		6-HR	24-HR	72-HR	4.98-HR
1371.	4.18	(CFS)	259.	259.	259.	259.
		(INCHES)	1.442	1.442	1.442	1.442
		(AC-FT)	107.	107.	107.	107.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
(AC-FT)	(HR)	6-HR	24-HR	72-HR	4.98-HR
8.	4.18	5.	5.	5.	5.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE		
(FEET)	(HR)	6-HR	24-HR	72-HR	4.98-HR
385.97	4.18	384.18	384.18	384.18	384.18

CUMULATIVE AREA = 1.39 SQ MI

STATION   DETAIN

```
                         (I) INFLOW,   (O) OUTFLOW
          0.       200.       400.       600.       800.      1000.      1200.      1400.      1600.         0.         0.         0.         0
                                                                                       (S) STORAGE
          0.         0.         0.         0.         0.         0.         2.         4.         6.         8.        10.         0.         0
DAHRMN PER
 11200   1.-I-------.---------.---------.---------.---------.---------.---------S---------.---------.---------.---------.---------.--------
 11201   2. I       .         .         .         .         .         .         S         .         .         .         .
 11202   3. OI      .         .         .         .         .         .         S         .         .         .         .
 11203   4. OI      .         .         .         .         .         .         S         .         .         .         .
 11204   5. OI      .         .         .         .         .         .         S         .         .         .         .
 11205   6. OI      .         .         .         .         .         .         S         .         .         .         .
 11206   7.  I      .         .         .         .         .         .         S         .         .         .         .
 11207   8.  OI     .         .         .         .         .         .         S         .         .         .         .
 11208   9.  OI     .         .         .         .         .         .         S         .         .         .         .
 11209  10.  OI     .         .         .         .         .         .         S         .         .         .         .
 11210  11. .OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
 11211  12.  OI     .         .         .         .         .         .         .S        .         .         .         .
 11212  13.   I     .         .         .         .         .         .         .S        .         .         .         .
 11213  14.   I     .         .         .         .         .         .         .S        .         .         .         .
 11214  15.   I     .         .         .         .         .         .         .S        .         .         .         .
 11215  16.   I     .         .         .         .         .         .         .S        .         .         .         .
 11216  17.   I     .         .         .         .         .         .         .S        .         .         .         .
 11217  18.   I     .         .         .         .         .         .         .S        .         .         .         .
 11218  19.   I     .         .         .         .         .         .         .S        .         .         .         .
 11219  20.   I     .         .         .         .         .         .         .S        .         .         .         .
 11220  21. . I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
 11221  22.   I     .         .         .         .         .         .         .S        .         .         .         .
 11222  23.   I     .         .         .         .         .         .         .S        .         .         .         .
 11223  24.   I     .         .         .         .         .         .         .S        .         .         .         .
 11224  25.   I     .         .         .         .         .         .         .S        .         .         .         .
 11225  26.   I     .         .         .         .         .         .         .S        .         .         .         .
 11226  27.   I     .         .         .         .         .         .         .S        .         .         .         .
 11227  28.   I     .         .         .         .         .         .         .S        .         .         .         .
 11228  29.   I     .         .         .         .         .         .         .S        .         .         .         .
 11229  30.   I     .         .         .         .         .         .         .S        .         .         .         .
 11230  31. . I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
 11231  32.   I     .         .         .         .         .         .         .S        .         .         .         .
 11232  33.   OI    .         .         .         .         .         .         .S        .         .         .         .
 11233  34.   OI    .         .         .         .         .         .         .S        .         .         .         .
 11234  35.   OI    .         .         .         .         .         .         . S       .         .         .         .
 11235  36.   OI    .         .         .         .         .         .         . S       .         .         .         .
 11236  37.   OI    .         .         .         .         .         .         . S       .         .         .         .
 11237  38.   OI    .         .         .         .         .         .         . S       .         .         .         .
 11238  39.    I    .         .         .         .         .         .         . S       .         .         .         .
 11239  40.    I    .         .         .         .         .         .         . S       .         .         .         .
 11240  41. . .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . .
 11241  42.    I    .         .         .         .         .         .         . S       .         .         .         .
 11242  43.    I    .         .         .         .         .         .         . S       .         .         .         .
 11243  44.    I    .         .         .         .         .         .         . S       .         .         .         .
 11244  45.    I    .         .         .         .         .         .         . S       .         .         .         .
 11245  46.    I    .         .         .         .         .         .         . S       .         .         .         .
 11246  47.    I    .         .         .         .         .         .         . S       .         .         .         .
 11247  48.    I    .         .         .         .         .         .         . S       .         .         .         .
 11248  49.    I    .         .         .         .         .         .         . S       .         .         .         .
 11249  50.    I    .         .         .         .         .         .         . S       .         .         .         .
 11250  51. . .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . .
 11251  52.    I    .         .         .         .         .         .         . S       .         .         .         .
 11252  53.    I    .         .         .         .         .         .         . S       .         .         .         .
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11253  54.   I   .    .    .    .    .    .    . S    .    .    .    .
11254  55.   I   .    .    .    .    .    .    . S    .    .    .    .
11255  56.   I   .    .    .    .    .    .    . S    .    .    .    .
11256  57.   I   .    .    .    .    .    .    . S    .    .    .    .
11257  58.   I   .    .    .    .    .    .    . S    .    .    .    .
11258  59.   I   .    .    .    .    .    .    . S    .    .    .    .
11259  60.   I   .    .    .    .    .    .    . S    .    .    .    .
11300  61. . .I. . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . .
11301  62.   I   .    .    .    .    .    .    . S    .    .    .    .
11302  63.   I   .    .    .    .    .    .    . S    .    .    .    .
11303  64.   I   .    .    .    .    .    .    . S    .    .    .    .
11304  65.   I   .    .    .    .    .    .    . S    .    .    .    .
11305  66.   I   .    .    .    .    .    .    . S    .    .    .    .
11306  67.   I   .    .    .    .    .    .    . S    .    .    .    .
11307  68.   I   .    .    .    .    .    .    . S    .    .    .    .
11308  69.   I   .    .    .    .    .    .    . S    .    .    .    .
11309  70.   I   .    .    .    .    .    .    . S    .    .    .    .
11310  71. . .I. . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . .
11311  72.   I   .    .    .    .    .    .    . S    .    .    .    .
11312  73.   I   .    .    .    .    .    .    . S    .    .    .    .
11313  74.   I   .    .    .    .    .    .    . S    .    .    .    .
11314  75.   I   .    .    .    .    .    .    . S    .    .    .    .
11315  76.   I   .    .    .    .    .    .    . S    .    .    .    .
11316  77.   I   .    .    .    .    .    .    . S    .    .    .    .
11317  78.   I   .    .    .    .    .    .    . S    .    .    .    .
11318  79.   I   .    .    .    .    .    .    . S    .    .    .    .
11319  80.   I   .    .    .    .    .    .    . S    .    .    .    .
11320  81. . .I. . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . .
11321  82.   I   .    .    .    .    .    .    . S    .    .    .    .
11322  83.   I   .    .    .    .    .    .    . S    .    .    .    .
11323  84.   I   .    .    .    .    .    .    . S    .    .    .    .
11324  85.   I   .    .    .    .    .    .    . S    .    .    .    .
11325  86.   I   .    .    .    .    .    .    . S    .    .    .    .
11326  87.  OI   .    .    .    .    .    .    . S    .    .    .    .
11327  88.  OI   .    .    .    .    .    .    . S    .    .    .    .
11328  89.  OI   .    .    .    .    .    .    . S    .    .    .    .
11329  90.  OI   .    .    .    .    .    .    . S    .    .    .    .
11330  91. . .OI . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . .
11331  92.  OI   .    .    .    .    .    .    . S    .    .    .    .
11332  93.    I  .    .    .    .    .    .    . S    .    .    .    .
11333  94.    I  .    .    .    .    .    .    . S    .    .    .    .
11334  95.    I  .    .    .    .    .    .    . S    .    .    .    .
11335  96.    I  .    .    .    .    .    .    . S    .    .    .    .
11336  97.    I  .    .    .    .    .    .    . S    .    .    .    .
11337  98.    I  .    .    .    .    .    .    .  S   .    .    .    .
11338  99.    I  .    .    .    .    .    .    .  S   .    .    .    .
11339 100.    I  .    .    .    .    .    .    .  S   .    .    .    .
11340 101. . . I . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
11341 102.    I  .    .    .    .    .    .    .  S   .    .    .    .
11342 103.    I  .    .    .    .    .    .    .  S   .    .    .    .
11343 104.    I  .    .    .    .    .    .    .  S   .    .    .    .
11344 105.    I  .    .    .    .    .    .    .  S   .    .    .    .
11345 106.    I  .    .    .    .    .    .    .  S   .    .    .    .
11346 107.    I  .    .    .    .    .    .    .  S   .    .    .    .
11347 108.    I  .    .    .    .    .    .    .  S   .    .    .    .
11348 109.    I  .    .    .    .    .    .    .  S   .    .    .    .
11349 110.    I  .    .    .    .    .    .    .  S   .    .    .    .
11350 111. . . I . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
11351 112.    I  .    .    .    .    .    .    .  S   .    .    .    .
11352 113.    I  .    .    .    .    .    .    .  S   .    .    .    .
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11353 114.    I  .    .    .    .    .    .    . S  .    .    .    .
11354 115.    I  .    .    .    .    .    .    . S  .    .    .    .
11355 116.    I  .    .    .    .    .    .    . S  .    .    .    .
11356 117.    I  .    .    .    .    .    .    . S  .    .    .    .
11357 118.    I  .    .    .    .    .    .    . S  .    .    .    .
11358 119.    I  .    .    .    .    .    .    . S  .    .    .    .
11359 120.    I  .    .    .    .    .    .    . S  .    .    .    .
11400 121. . . I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . .
11401 122.    I  .    .    .    .    .    .    . S  .    .    .    .
11402 123.    OI .    .    .    .    .    .    . S  .    .    .    .
11403 124.    OI .    .    .    .    .    .    . S  .    .    .    .
11404 125.    OI .    .    .    .    .    .    . S  .    .    .    .
11405 126.    OI .    .    .    .    .    .    . S  .    .    .    .
11406 127.    OI .    .    .    .    .    .    . S  .    .    .    .
11407 128.    OI .    .    .    .    .    .    . S  .    .    .    .
11408 129.     I .    .    .    .    .    .    . S  .    .    .    .
11409 130.     I .    .    .    .    .    .    . S  .    .    .    .
11410 131. . . .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . .
11411 132.     I .    .    .    .    .    .    . S  .    .    .    .
11412 133.     I .    .    .    .    .    .    . S  .    .    .    .
11413 134.     I .    .    .    .    .    .    . S  .    .    .    .
11414 135.     I .    .    .    .    .    .    . S  .    .    .    .
11415 136.     I .    .    .    .    .    .    . S  .    .    .    .
11416 137.     I .    .    .    .    .    .    . S  .    .    .    .
11417 138.     I .    .    .    .    .    .    .  S .    .    .    .
11418 139.     I .    .    .    .    .    .    .  S .    .    .    .
11419 140.     I .    .    .    .    .    .    .  S .    .    .    .
11420 141. . . .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . .
11421 142.     I .    .    .    .    .    .    .  S .    .    .    .
11422 143.     I .    .    .    .    .    .    .  S .    .    .    .
11423 144.     I .    .    .    .    .    .    .  S .    .    .    .
11424 145.     I .    .    .    .    .    .    .  S .    .    .    .
11425 146.     I .    .    .    .    .    .    .  S .    .    .    .
11426 147.     I .    .    .    .    .    .    .  S .    .    .    .
11427 148.     I .    .    .    .    .    .    .  S .    .    .    .
11428 149.     I .    .    .    .    .    .    .  S .    .    .    .
11429 150.     I .    .    .    .    .    .    .  S .    .    .    .
11430 151. . . .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . .
11431 152.     OI .   .    .    .    .    .    .  S .    .    .    .
11432 153.     OI .   .    .    .    .    .    .  S .    .    .    .
11433 154.     OI .   .    .    .    .    .    .  S .    .    .    .
11434 155.     OI .   .    .    .    .    .    .  S .    .    .    .
11435 156.     OI .   .    .    .    .    .    .  S .    .    .    .
11436 157.      I .   .    .    .    .    .    .  S .    .    .    .
11437 158.      I .   .    .    .    .    .    .  S .    .    .    .
11438 159.      I .   .    .    .    .    .    .  S .    .    .    .
11439 160.      I .   .    .    .    .    .    .  S .    .    .    .
11440 161. . . . I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . .
11441 162.      I .   .    .    .    .    .    .  S .    .    .    .
11442 163.      I .   .    .    .    .    .    .  S .    .    .    .
11443 164.      OI.   .    .    .    .    .    .   S .    .    .    .
11444 165.      OI.   .    .    .    .    .    .   S .    .    .    .
11445 166.      OI.   .    .    .    .    .    .   S .    .    .    .
11446 167.      OI.   .    .    .    .    .    .   S .    .    .    .
11447 168.      OI.   .    .    .    .    .    .   S .    .    .    .
11448 169.      OI.   .    .    .    .    .    .   S .    .    .    .
11449 170.       I.   .    .    .    .    .    .   S .    .    .    .
11450 171. . . . .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . .
11451 172.       I.   .    .    .    .    .    .   S .    .    .    .
11452 173.       I.   .    .    .    .    .    .   S .    .    .    .
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11453 174.        I.         .         .         .         .         .         .    S    .         .         .         .
11454 175.        I.         .         .         .         .         .         .    S    .         .         .         .
11455 176.        I.         .         .         .         .         .         .    S    .         .         .         .
11456 177.        I.         .         .         .         .         .         .    S    .         .         .         .
11457 178.        OI         .         .         .         .         .         .    S    .         .         .         .
11458 179.        OI         .         .         .         .         .         .    S    .         .         .         .
11459 180.        OI         .         .         .         .         .         .     S   .         .         .         .
11500 181. . . . .OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . .
11501 182.        OI         .         .         .         .         .         .     S   .         .         .         .
11502 183.        OI         .         .         .         .         .         .     S   .         .         .         .
11503 184.         I         .         .         .         .         .         .     S   .         .         .         .
11504 185.         I         .         .         .         .         .         .     S   .         .         .         .
11505 186.         I         .         .         .         .         .         .     S   .         .         .         .
11506 187.         I         .         .         .         .         .         .     S   .         .         .         .
11507 188.         I         .         .         .         .         .         .     S   .         .         .         .
11508 189.         I         .         .         .         .         .         .     S   .         .         .         .
11509 190.         I         .         .         .         .         .         .     S   .         .         .         .
11510 191. . . . . I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . .
11511 192.         OI        .         .         .         .         .         .     S   .         .         .         .
11512 193.         OI        .         .         .         .         .         .     S   .         .         .         .
11513 194.         OI        .         .         .         .         .         .     S   .         .         .         .
11514 195.         OI        .         .         .         .         .         .      S  .         .         .         .
11515 196.         O I       .         .         .         .         .         .      S  .         .         .         .
11516 197.         O I       .         .         .         .         .         .      S  .         .         .         .
11517 198.         O I       .         .         .         .         .         .      S  .         .         .         .
11518 199.         O I       .         .         .         .         .         .      S  .         .         .         .
11519 200.         O  I      .         .         .         .         .         .       S .         .         .         .
11520 201. . . . . O .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . .
11521 202.         O  I      .         .         .         .         .         .       S .         .         .         .
11522 203.         .O I      .         .         .         .         .         .        S.         .         .         .
11523 204.         .O I      .         .         .         .         .         .        S.         .         .         .
11524 205.         .O  I     .         .         .         .         .         .         S         .         .         .
11525 206.         .O  I     .         .         .         .         .         .         S         .         .         .
11526 207.         .O  I     .         .         .         .         .         .         S         .         .         .
11527 208.         .O  I     .         .         .         .         .         .         .S        .         .         .
11528 209.         .O . I    .         .         .         .         .         .         .S        .         .         .
11529 210.         .O   I    .         .         .         .         .         .         . S       .         .         .
11530 211. . . . . .O. .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . .
11531 212.         . O   I   .         .         .         .         .         .         .  S      .         .         .
11532 213.         . O   I   .         .         .         .         .         .         .  S      .         .         .
11533 214.         . O    I  .         .         .         .         .         .         .   S     .         .         .
11534 215.         .     O I .         .         .         .         .         .         .    S    .         .         .
11535 216.         .      OI .         .         .         .         .         .         .    S    .         .         .
11536 217.         .       OI.         .         .         .         .         .         .    S    .         .         .
11537 218.         .        OI         .         .         .         .         .         .    S    .         .         .
11538 219.         .         I         .         .         .         .         .         .    S    .         .         .
11539 220.         .         OI        .         .         .         .         .         .    S    .         .         .
11540 221. . . . . . . . . .OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .  .S. . . . . . . . . . . . . . . .
11541 222.         .         . I       .         .         .         .         .         .    S    .         .         .
11542 223.         .         . OI      .         .         .         .         .         .     S   .         .         .
11543 224.         .         .  I      .         .         .         .         .         .     S   .         .         .
11544 225.         .         .  OI     .         .         .         .         .         .     S   .         .         .
11545 226.         .         .   OI    .         .         .         .         .         .     S   .         .         .
11546 227.         .         .    I    .         .         .         .         .         .     S   .         .         .
11547 228.         .         .    OI   .         .         .         .         .         .     S   .         .         .
11548 229.         .         .     OI  .         .         .         .         .         .     S   .         .         .
11549 230.         .         .      I  .         .         .         .         .         .     S   .         .         .
11550 231. . . . . . . . . . . . . .OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . .
11551 232.         .         .       O I         .         .         .         .         .     S   .         .         .
11552 233.         .         .         O I       .         .         .         .         .      S  .         .         .
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11553 234.         .         .         . O I     .         .         .         .         .      S  .         .         .
11554 235.         .         .         .   O I   .         .         .         .         .      S  .         .         .
11555 236.         .         .         .     O I .         .         .         .         .      S  .         .         .
11556 237.         .         .         .        O.I        .         .         .         .       S .         .         .
11557 238.         .         .         .         .O I      .         .         .         .       S .         .         .
11558 239.         .         .         .         .  O I    .         .         .         .       S .         .         .
11559 240.         .         .         .         .    O I  .         .         .         .        S.         .         .
11600 241. . . . . . . . . . . . . . . . . . . . . . .O.I. . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . .
11601 242.         .         .         .         .        O.I        .         .         .        S.         .         .
11602 243.         .         .         .         .         .O I      .         .         .        S.         .         .
11603 244.         .         .         .         .         .  O I    .         .         .         S         .         .
11604 245.         .         .         .         .         .    O I  .         .         .         S         .         .
11605 246.         .         .         .         .         .       O I         .         .         S         .         .
11606 247.         .         .         .         .         .         O I       .         .         .S        .         .
11607 248.         .         .         .         .         .         . O I     .         .         .S        .         .
11608 249.         .         .         .         .         .         .   O I   .         .         .S        .         .
11609 250.         .         .         .         .         .         .     O I .         .         .S        .         .
11610 251. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .O I . . . . . . . . . . S . . . . . . . . . . . . .
11611 252.         .         .         .         .         .         .      I O.         .         . S       .         .
11612 253.         .         .         .         .         .         .   I  O  .         .         . S       .         .
11613 254.         .         .         .         .         .         .I  O     .         .         .S        .         .
11614 255.         .         .         .         .         .        I.O        .         .         .S        .         .
11615 256.         .         .         .         .         .     I  O.         .         .         S         .         .
11616 257.         .         .         .         .         .  I  O   .         .         .         S         .         .
11617 258.         .         .         .         .         I  O      .         .         .         S         .         .
11618 259.         .         .         .         .      I  O         .         .         .        S.         .         .
11619 260.         .         .         .         .   I  O  .         .         .         .        S.         .         .
11620 261. . . . . . . . . . . . . . . . . . . .I. O . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . .
11621 262.         .         .         .       I .O        .         .         .         .       S .         .         .
11622 263.         .         .         .    I  O .         .         .         .         .       S .         .         .
11623 264.         .         .         . I  O    .         .         .         .         .      S  .         .         .
11624 265.         .         .         I O       .         .         .         .         .      S  .         .         .
11625 266.         .         .      I  O         .         .         .         .         .      S  .         .         .
11626 267.         .         .   I  O  .         .         .         .         .         .     S   .         .         .
11627 268.         .         .I  O     .         .         .         .         .         .     S   .         .         .
11628 269.         .       I .O        .         .         .         .         .         .    S    .         .         .
11629 270.         .    I  O .         .         .         .         .         .         .    S    .         .         .
11630 271. . . . . I .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . .
11631 272.         . IO      .         .         .         .         .         .         .   S     .         .         .
11632 273.         . I       .         .         .         .         .         .         .   S     .         .         .
11633 274.         . I       .         .         .         .         .         .         .   S     .         .         .
11634 275.         .IO       .         .         .         .         .         .         .   S     .         .         .
11635 276.         .IO       .         .         .         .         .         .         .   S     .         .         .
11636 277.         .IO       .         .         .         .         .         .         .   S     .         .         .
11637 278.         .IO       .         .         .         .         .         .         .   S     .         .         .
11638 279.         .IO       .         .         .         .         .         .         .   S     .         .         .
11639 280.         I O       .         .         .         .         .         .         .   S     .         .         .
11640 281. . . . . I O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . .
11641 282.         I O       .         .         .         .         .         .         .  S      .         .         .
11642 283.         I O       .         .         .         .         .         .         .  S      .         .         .
11643 284.         IO        .         .         .         .         .         .         .  S      .         .         .
11644 285.        I.O        .         .         .         .         .         .         . S       .         .         .
11645 286.        I.O        .         .         .         .         .         .         . S       .         .         .
11646 287.        I.O        .         .         .         .         .         .         . S       .         .         .
11647 288.        I.O        .         .         .         .         .         .         .S        .         .         .
11648 289.        I.O        .         .         .         .         .         .         .S        .         .         .
11649 290.       I .O        .         .         .         .         .         .         .S        .         .         .
11650 291. . . . I .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S . . . . . . . . . . . . . . . . . . .
11651 292.       I .O        .         .         .         .         .         .         S         .         .         .
11652 293.       I .O        .         .         .         .         .         .         S         .         .         .
```

```
11653 294.       I .O         .         .         .         .         .         .        S.         .         .         .
11654 295.       I .O         .         .         .         .         .         .        S.         .         .         .
11655 296.       I .O         .         .         .         .         .         .       S .         .         .         .
11656 297.       I O          .         .         .         .         .         .       S .         .         .         .
11657 298.       I O          .         .         .         .         .         .       S .         .         .         .
11658 299.      I  O          .         .         .         .         .         .      S  .         .         .         .
11659 300.------I--O----------.---------.---------.---------.---------.---------.------S--.---------.---------.---------.---------
```

RUNOFF SUMMARY

FLOW IN CUBIC FEET PER SECOND

TIME IN HOURS, AREA IN SQUARE MILES

		PEAK	TIME OF	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN	MAXIMUM	TIME OF
OPERATION	STATION	FLOW	PEAK	6-HOUR	24-HOUR	72-HOUR	AREA	STAGE	MAX STAGE
HYDROGRAPH AT	100_bsnB	1404.	4.17	263.	263.	263.	1.39		
ROUTED TO	DETAIN	1371.	4.18	259.	259.	259.	1.39	385.97	4.18

*** 1 ERROR(S) DETECTED BY HEC-1 ***

APPENDIX F

Hydraulic Calculations for "Weir" Spillway Sizing

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HYDRAULIC CALCULATIONS FOR "WEIR" SPILLWAY SIZING:

<u>FOREBAY SPILLWAY</u> - Into Water Quality Basin

Originally sized to convey $Q_{100} = 976$ cfs $\Rightarrow$ yielded $L_{MIN} = 75'$

Should be sized to convey $Q_{100} = 1404$ cfs

$Q = CLH^{3/2}$, $C = 3.3$ (sharp-crested weir with a height greater than 1/5 the head, per "Design of Small Dams," p. 369)

$$L_{MIN} = \frac{Q}{CH^{3/2}} = \frac{1404}{(3.3)(2.5)^{3/2}} = 107.6'$$

$H = 2.5$, $(385.0 - 382.5)$

Length provided = 100' at ELEV 382.5
plus 10' Access Road at ELEV 383.5

$$\therefore \text{Total } Q_{WEIR} = (3.3)(100)(2.5)^{1.5} + (3.3)(10)(1.5)^{1.5}$$

$$= 1304 \text{ cfs} + 60 \text{ cfs}$$

$$= 1364 \text{ cfs}$$

[NOTE: The weir has full capacity of 1404 cfs at EL = 385.2]

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(CONT'D)

BASIN SPILLWAY - Into Existing Channel and Culverts

* Sized to convey Qcapacity of Both 58"×36" CMP Culverts

- per MDP, $Q_{CAPACITY} = 236$ cfs (Total for Both Culverts)

$Q_{WEIR} = CLH^{3/2}$, $C = 3.3$ (see Page 1 of 2)
$H = 1.0$ (384.1' − 383.1')

$\therefore L_{MIN} = \dfrac{Q}{CH^{3/2}} = \dfrac{(236)}{(3.3)(1)^{3/2}} = 71.5'$

Length provided ≈ 105', ∴ okay

APPENDIX G

Back-up Information for

Quantities and Cost Estimate Calculations

RICK™
ENGINEERING COMPANY

Woodside Avenue
Opinion of Probable Construction Costs
Job Number 14804-B
Revised: April 20, 2005

Item	Quantity	Unit	@	Unit Price	Subtotal
Water Pollution Control	1	LS	@	$15,000.00	$15,000.00
Project Identification Sign	1	LS	@	$1,000.00	$1,000.00
Field Orders	1	LS	@	$10,000.00	$10,000.00
Prepare Storm Water Pollution Prevention Plan	1	LS	@	$10,000.00	$10,000.00
Clearing & Grubbing	1	LS	@	$9,540.00	$9,540.00
Excavation & Embankment	50	CY	@	$10.00	$500.00
Excavation & Export	18,500	CY	@	$17.00	$314,500.00
Erosion Control (Type D)	8,222	SY	@	$0.80	$6,577.60
Move In - Move Out (Erosion Control)	1	LS	@	$2,500.00	$2,500.00
Irrigation	1	LS	@	$40,781.00	$40,781.00
Planting	1	LS	@	$29,630.00	$29,630.00
Plant Establishment	1	LS	@	$6,162.00	$6,162.00
Temporary Gravel Bags	114	EA	@	$2.00	$228.00
Temporary Sand Bags	1,800	EA	@	$2.00	$3,600.00
Traffic Control	1	LS	@	$10,000.00	$10,000.00
12" PVC Pipe	12	LF	@	$50.00	$600.00
Concrete Minor Structure (Winged Headwall)	1	CY	@	$1,500.00	$1,500.00
Concreted Cobble Bench	1	CY	@	$100.00	$100.00
Concreted Minor Structure (Sill)	31	CY	@	$200.00	$6,200.00
Minor Concrete (Access Road Thickened Edge)	37	CY	@	$250.00	$9,250.00
Hesco Wall System	101	LF	@	$53.50	$5,403.50
Debris Rack & Plate	1	LF	@	$1,000.00	$1,000.00
Chain Link Fence - 6'	114	LF	@	$30.00	$3,420.00
Chain Gate (L=6')	2	EA	@	$400.00	$800.00
Temporary Concrete Washout (Portable)	1	LS	@	$1,000.00	$1,000.00
Armor Flex Blanket	4,104	SF	@	$9.00	$36,936.00
Minor Concrete (Sampling Pads)	3	EA	@	$200.00	$600.00
1" Meter	1	EA	@	$500.00	$500.00
Kiosk	1	LS	@	$5,000.00	$5,000.00
Sediment Post	5	EA	@	$200.00	$1,000.00
Rip Rap	2	CY	@	$200.00	$400.00
				Subtotal:	$533,728.10
				15% Contingency:	$80,059.22
				Total:	$613,787.32

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SAN DIEGO RIVERSIDE ORANGE SACRAMENTO PHOENIX TUCSON

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4/18/05
14804 b

Erosion Control $\frac{125' \times 592'}{9'/sy.} = 8222$ sy.

Temp Sand Bags. 570' ÷ 1.16 = 492 × 3 high = 1476.

Trans 30' ÷ 1.16 = 26 × 5.5 avg = 143

Add bags for Trans 200 ÷ 1.16 = 172 × 1 = 172

1791
say 1800

Gravel Bags 6 × 5 ea = 30

(9 ÷ 1.16) × (3×3) + 3(2) + 3×2
(8 × 9) + 6 + 6
72 + 12 = 84

114

Wingwall
Fl. + Sill 1.5 × 2.67 × .75 = 3
Wings 2(3.16 × 2.2 × .67) = 9.3
Headwall 3.8 × 3 × .67 = 7.64

19.94 say 1 cu yd

Excav. + Export – Surface generated

50 yd³ fill
18550 yd cut

18,500 export

4.50 exc.
5.00 haul
6.00 dump fees
1.00 mob. + demob

16.50 say 17.00

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4/18/05
14604b
2 of 2

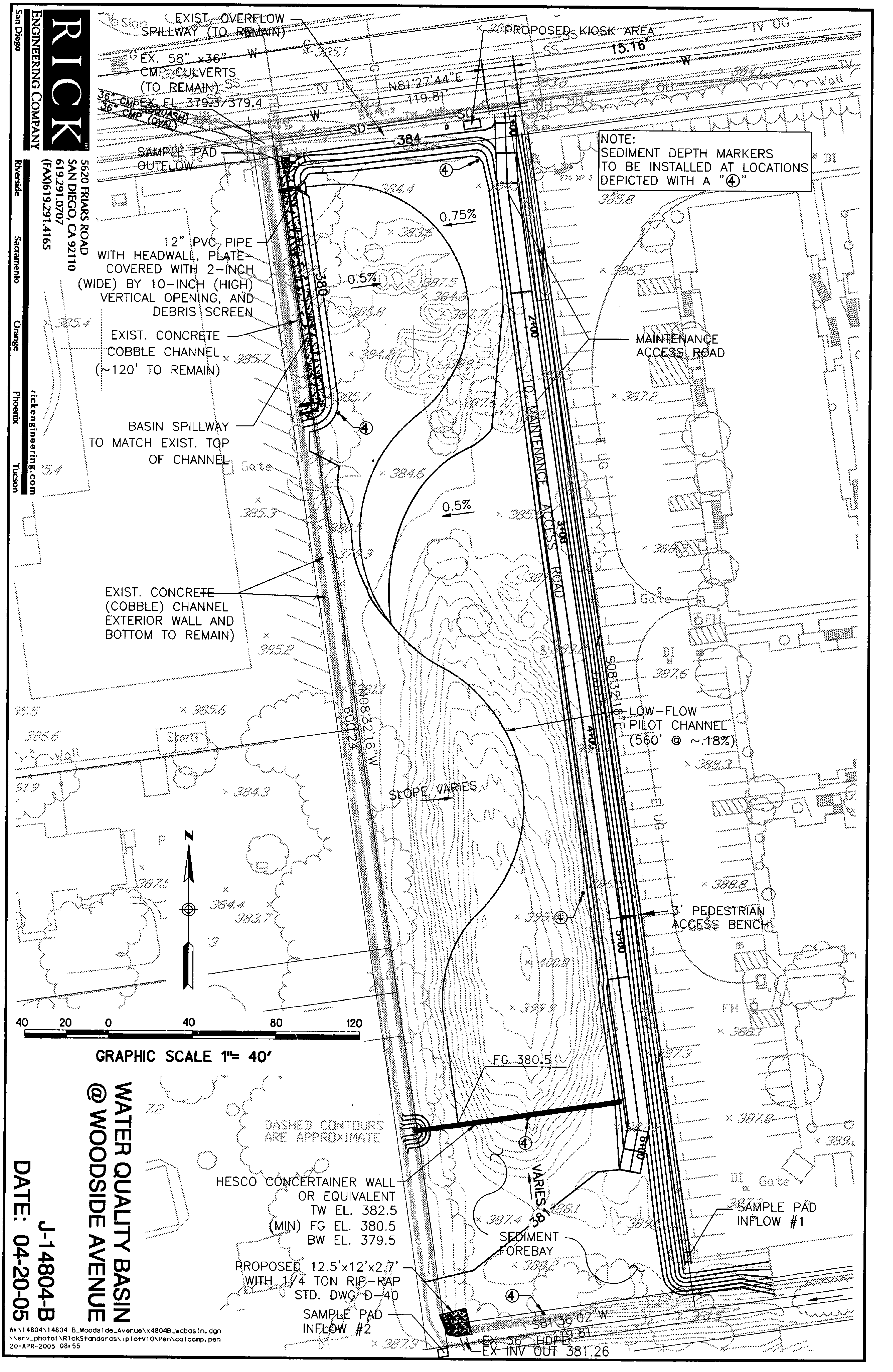
Blanket (Aroma Fley 513×8 = 4104 sf.

Minor Conc. (Thickened Edge)

$$\frac{1' \times 2' \times 500'}{27} = 37\,cy.$$

APPENDIX H

Basin Layout for Water Quality Basin at Woodside Avenue


RICK ENGINEERING COMPANY
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SAN DIEGO, CA 92110
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(FAX)619.291.4165
rickengineering.com
San Diego Riverside Sacramento Orange Phoenix Tucson
EXIST. OVERFLOW SPILLWAY (TO REMAIN)
EX. 58" x36" CMP CULVERTS (TO REMAIN)
36" CMP (SQUASH)
36" CMP (OVAL)
EX. EL 379.3/379.4
PROPOSED KIOSK AREA
15.16'
N81°27'44"E
119.81
384
SAMPLE PAD OUTFLOW
NOTE:
SEDIMENT DEPTH MARKERS TO BE INSTALLED AT LOCATIONS DEPICTED WITH A "④"
0.75%
0.5%
12" PVC PIPE WITH HEADWALL, PLATE COVERED WITH 2-INCH (WIDE) BY 10-INCH (HIGH) VERTICAL OPENING, AND DEBRIS SCREEN
380
EXIST. CONCRETE COBBLE CHANNEL (~120' TO REMAIN)
MAINTENANCE ACCESS ROAD
BASIN SPILLWAY TO MATCH EXIST. TOP OF CHANNEL
10' MAINTENANCE ACCESS ROAD
0.5%
EXIST. CONCRETE (COBBLE) CHANNEL EXTERIOR WALL AND BOTTOM TO REMAIN)
N08°32'16"W
600.24
S08°32'16"E
LOW-FLOW PILOT CHANNEL (560' @ ~.18%)
SLOPE VARIES
3' PEDESTRIAN ACCESS BENCH
GRAPHIC SCALE 1"= 40'
40 20 0 40 80 120
FG 380.5
DASHED CONTOURS ARE APPROXIMATE
HESCO CONCERTAINER WALL OR EQUIVALENT
TW EL. 382.5
(MIN) FG EL. 380.5
BW EL. 379.5
VARIES
381
SEDIMENT FOREBAY
SAMPLE PAD INFLOW #1
PROPOSED 12.5'x12'x2.7' WITH 1/4 TON RIP-RAP STD. DWG D-40
SAMPLE PAD INFLOW #2
S81°36'02"W
119.81
EX 36" HDPE
EX INV OUT 381.26
WATER QUALITY BASIN @ WOODSIDE AVENUE
J-14804-B
DATE: 04-20-05
W:\14804\14804-B_Woodside_Avenue\x4804B_wqbasin.dgn
\\srv_photo1\RickStandards\iplotV10\Pen\calcomp.pen
20-APR-2005 08:55

MAP POCKET 1

Copy of Sheets 2-5 of the Final Grading Plans

(For Reference Only)

-1	0	1	2	3	4	5	6	7	8	9	10

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

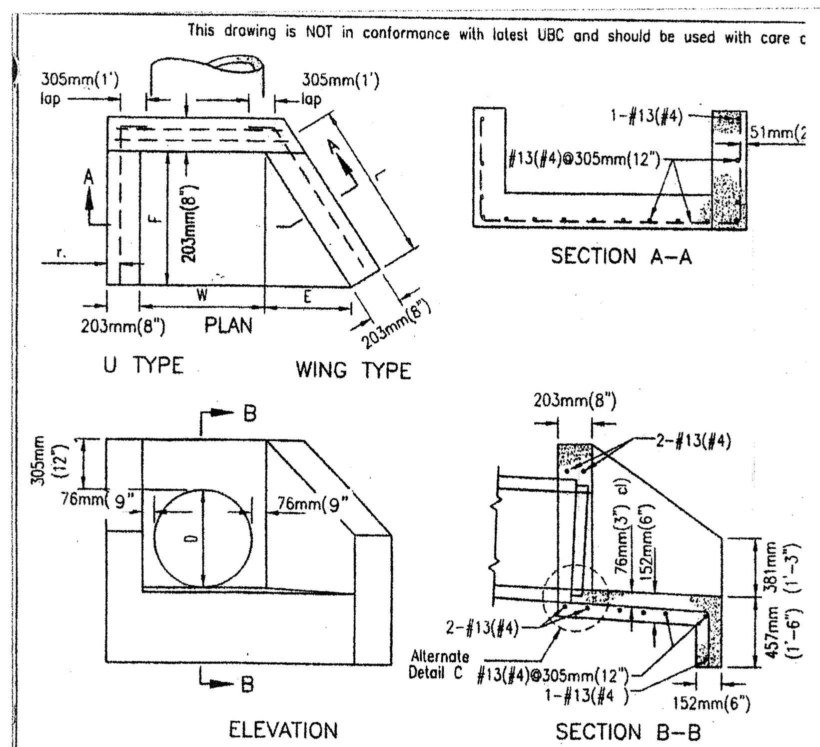
PLANS	BY	DATE
DESIGNED	BRENDAN HASTIE	
CHECKED	CARL HEWINGS	
DELINEATED	BRIAN LEDGERWOOD	

REGISTERED PROFESSIONAL ENGINEER
John D. Goddard
No. 33037
Exp. 6/30/06
CIVIL
STATE OF CALIFORNIA

RICK ENGINEERING
5620 FRIARS RD.
SAN DIEGO, CA. 92110
619-291-0707

REGISTERED CIVIL ENGINEER DATE

This drawing is NOT in conformance with latest UBC and should be used with care

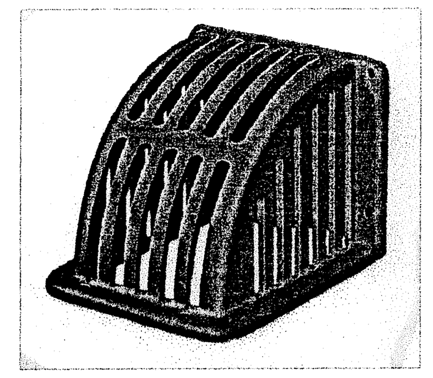


	DIA OF PIPE	DIMENSIONS L	DIMENSIONS E	DIMENSIONS F	DOUBLE PIPE W	DOUBLE PIPE U TYPE CONC.	DOUBLE PIPE U TYPE STEEL	DOUBLE PIPE WING TYPE CONC.	DOUBLE PIPE WING TYPE STEEL	DOUBLE PIPE W	DOUBLE PIPE U TYPE CONC.	DOUBLE PIPE U TYPE STEEL	DOUBLE PIPE WING CONC.
Metric	457mm	689mm	381mm	571mm	610mm	0.43kg	16kg	0.49kg	20kg	AS SHOWN ON PLANS	0.63kg	24kg	0.69kg
US	18"	2'-3 1/8"	1'-3"	1'-10 1/2"	2'-0"	0.55yd	35lb	0.63yd	43lb		0.82yd	53lb	0.90yd
Metric	610mm	962mm	533mm	800mm	762mm	0.61kg	22kg	0.72kg	28kg		1.0kg	34kg	1.1kg
US	12"	3'-1 7/8"	1'-9"	2'-7 1/2"	2'-6"	0.79yd	47lb	0.93yd	60lb		1.22yd	73lb	1.36yd
Metric	762mm	1.24m	686mm	1.03m	914mm	.81kg	33kg	1.0kg	39kg		1.3kg	50kg	1.5kg
US	30"	4'-0 5/8"	2'-3"	3'-4 1/2"	3'-0"	1.05yd	71lb	1.29yd	85lb		1.66yd	109lb	1.92yd
Metric	914mm	1.51m	838mm	1.26m	1.07m	1.02kg	40kg	1.30kg	52kg		1.70kg	62kg	1.95kg
US	36"	4'-11 1/2"	2'-9"	4'-1 1/2"	3'-6"	1.33yd	88lb	1.69yd	114lb		2.19yd	136lb	2.55yd

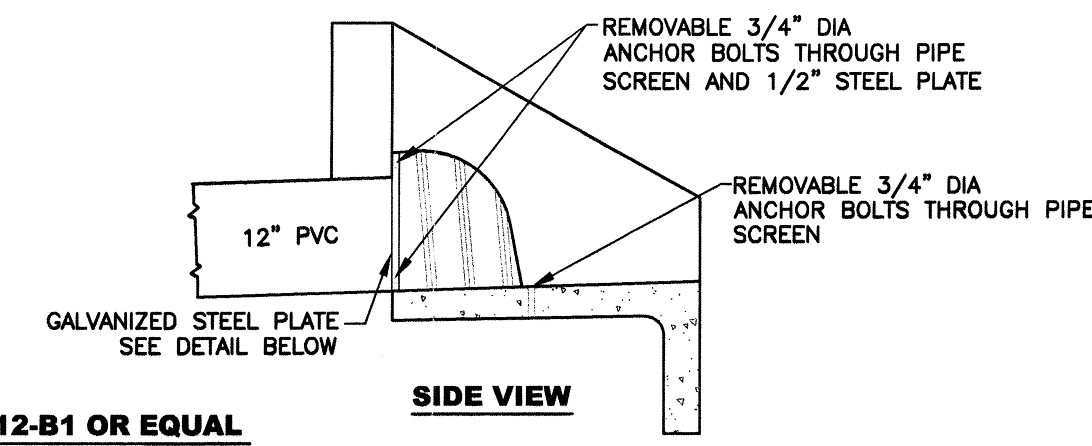
NOTES:
1. Concrete shall be $332kg/M^3$ -C-22Mpa (560-C-3250)
2. Exposed corners to be chamfered 3/4".
3. Multiple pipes to be set a distance of D/2, with a 305mm(1') minimum between outside diameters of
4. Top of headwall shall be placed approximately parallel to profile grade when the grade is 3% or more.
5. Skewed pipes: Dimension W to be increased in width or length due to skew or multiple pipes.
6. For pipe wall thickness greater than 76mm(3") use alternate Detail-C.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING
ORIGINAL		Kercheval	12/75	MODIFIED HEADWALL
Add Metric		T. Stanton	03/03	

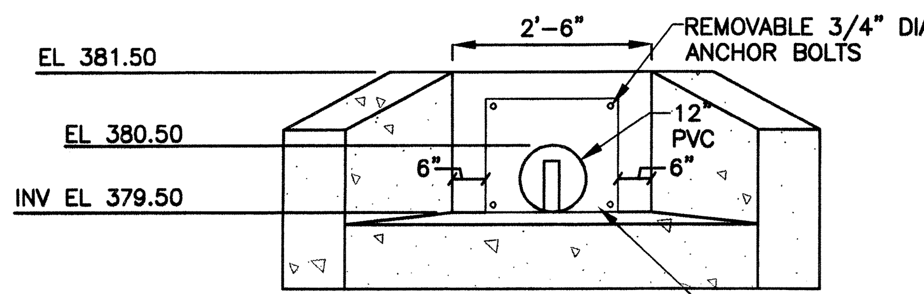
DETAIL 2/4/5



1/4/5 OUTLET PROTECTION ~ NEENAH R-7512-B1 OR EQUAL
CAST IRON PIPE SCREEN FOR 12" PIPE, DEBRIS RACK TO BE MOUNTED TO HEADWALL AND APRON



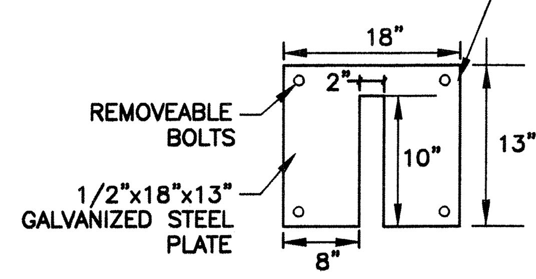
SIDE VIEW



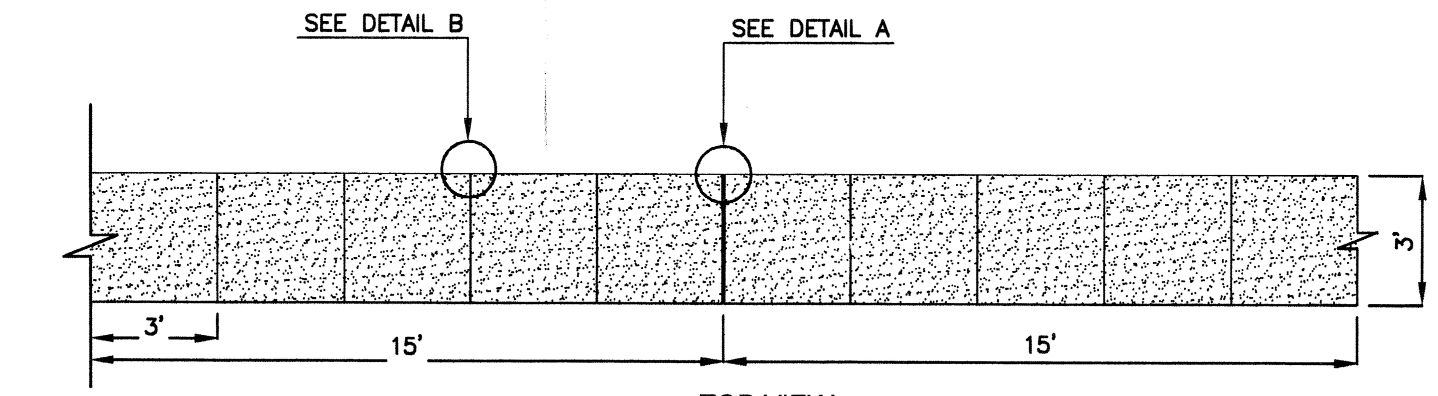
FRONT VIEW
NTS

CAST IRON PIPE SCREEN FOR 12" PIPE			
WIDTH	HEIGHT	LENGTH	OPENING
18"	13"	18"	1"

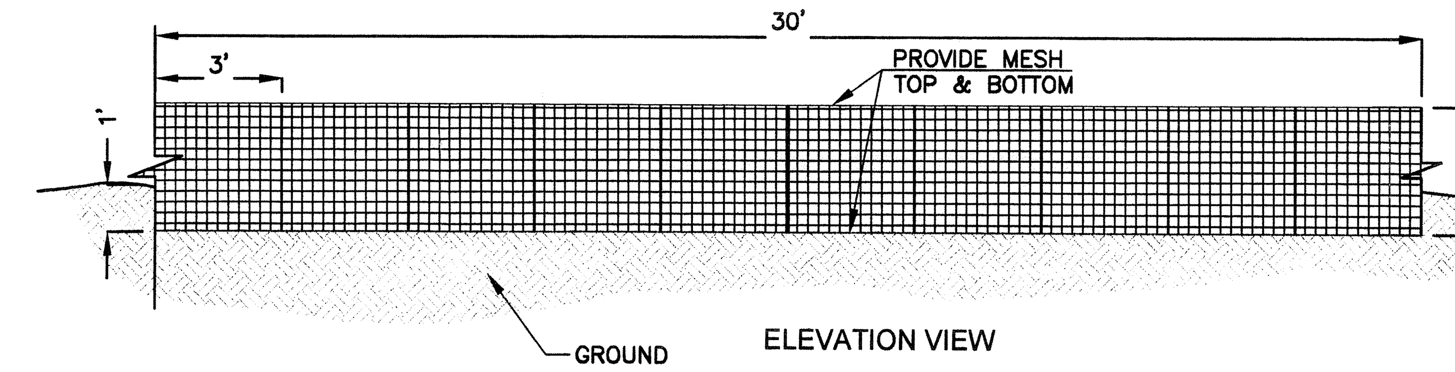
* SIX 3/4" HOLES FOR ANCHOR BOLTS



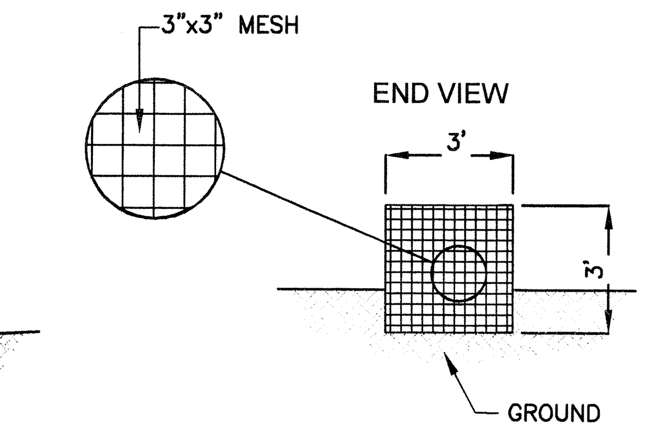
GALVANIZED STEEL PLATE



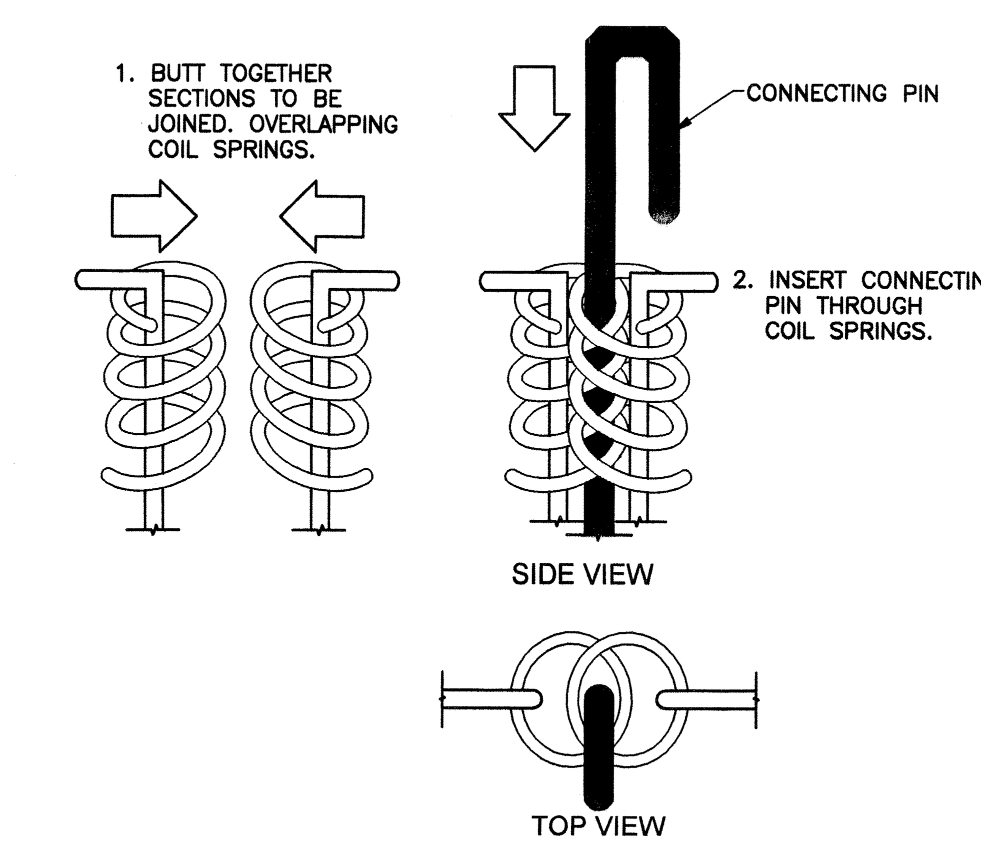
TOP VIEW



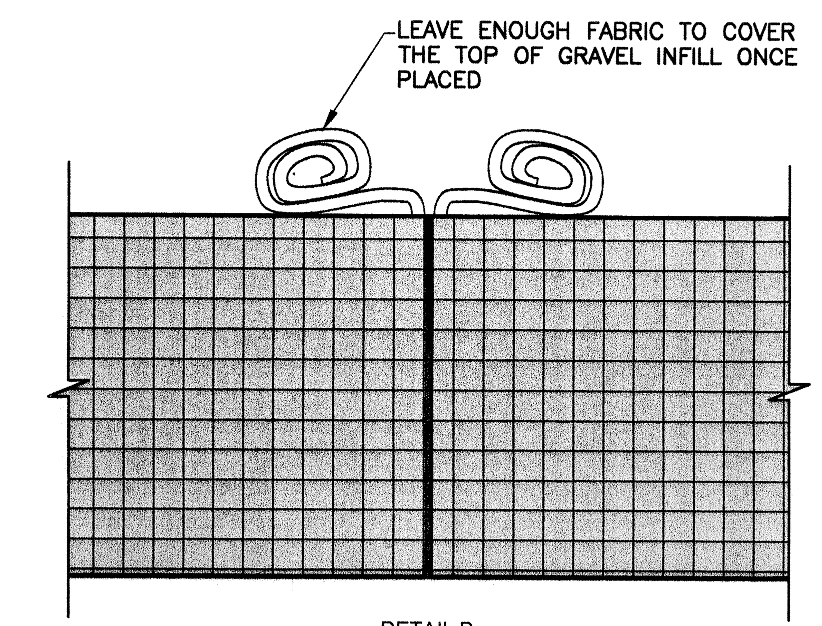
ELEVATION VIEW



END VIEW



DETAIL A
INTERLOCKING DETAIL
NTS



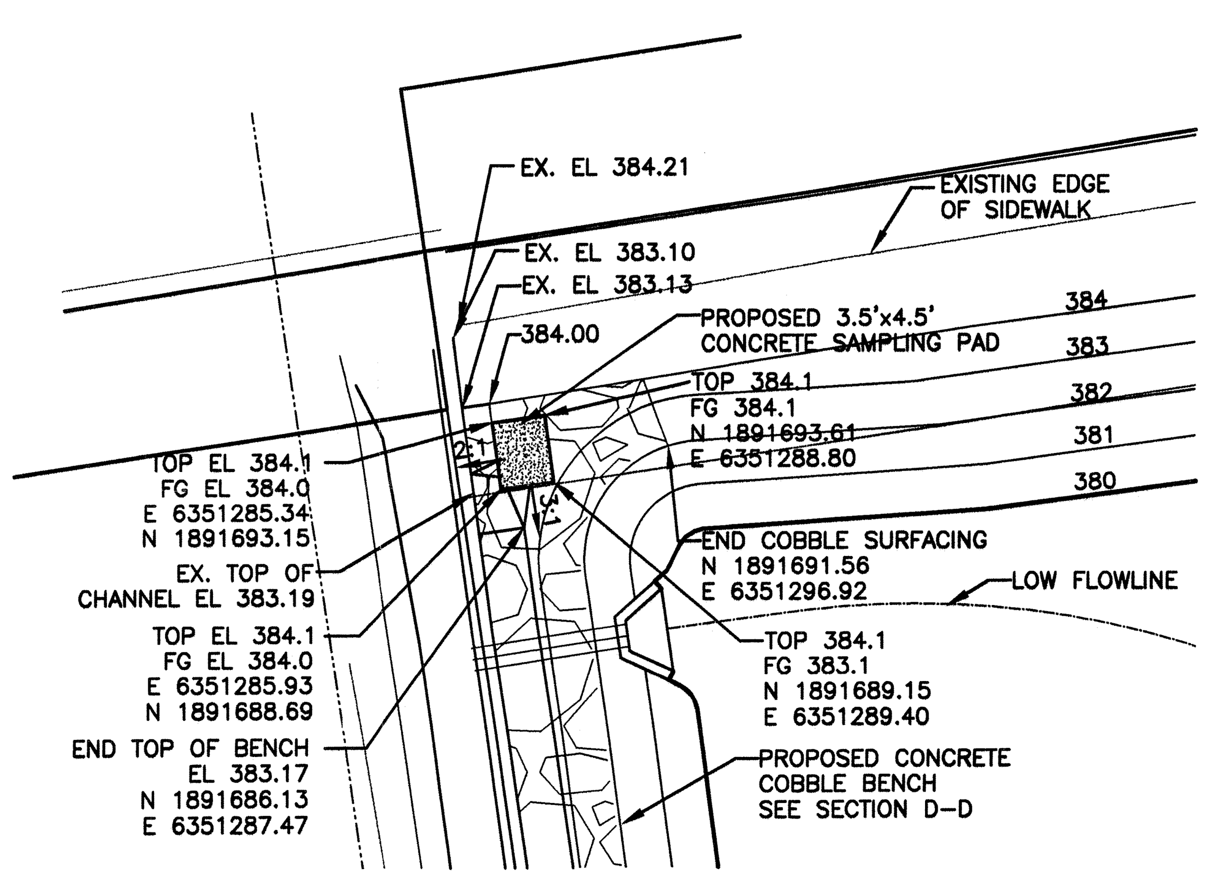
DETAIL B
REMOVEABLE LINER DETAIL
NTS

NOTE:

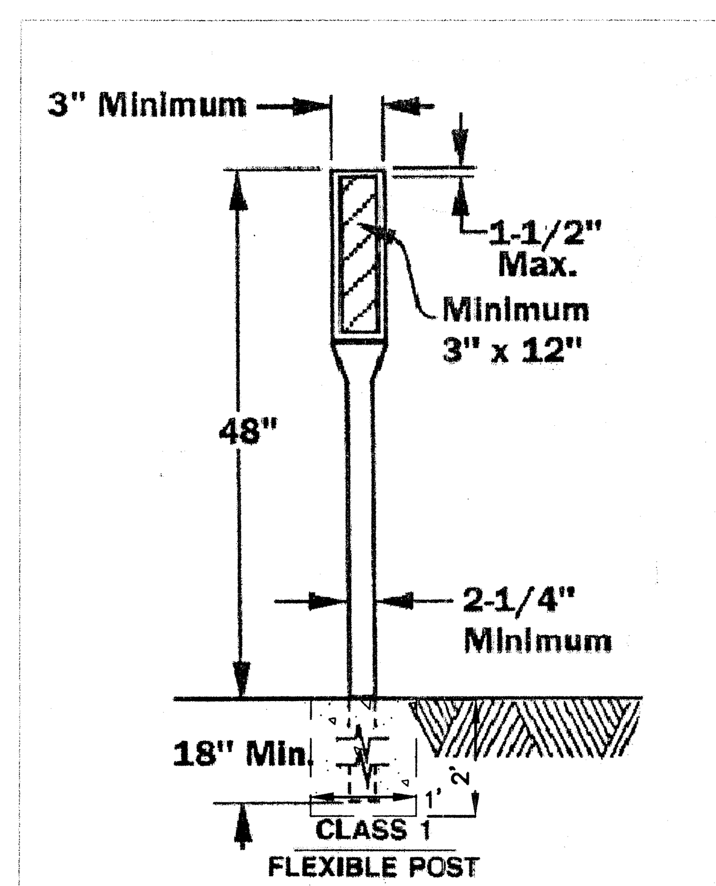
WHEN UNITS ARE JOINED WITH ZIP PINS, THE GEO LINER IS ROLLED BACK, ALLOWING CONTINUOUS 2" MINUS/ GRAVEL INFILL, EFFECTIVELY CREATING A CONTINUOUS BARRIER.

HESCO WALL SYSTEM (OR APPROVED EQUIVALENT) SHALL HAVE WIRE MESH TOP HINGED TO SYSTEM & SECURELY FASTENED.

4/4/5 HESCOWALL INSTALLATION DETAIL
NTS



3/4/5 DETAIL
SCALE 1" = 10'



5/4/5 48" CLASS 1 (FLEXIBLE POST) DELINEATOR WITH BELOW SURFACE ANCHOR
NTS

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

PLANS	BY	DATE
DESIGNED	BRENDAN HASTIE	
CHECKED	CARL HEWINGS	
DELINEATED	BRIAN LEDGERWOOD	

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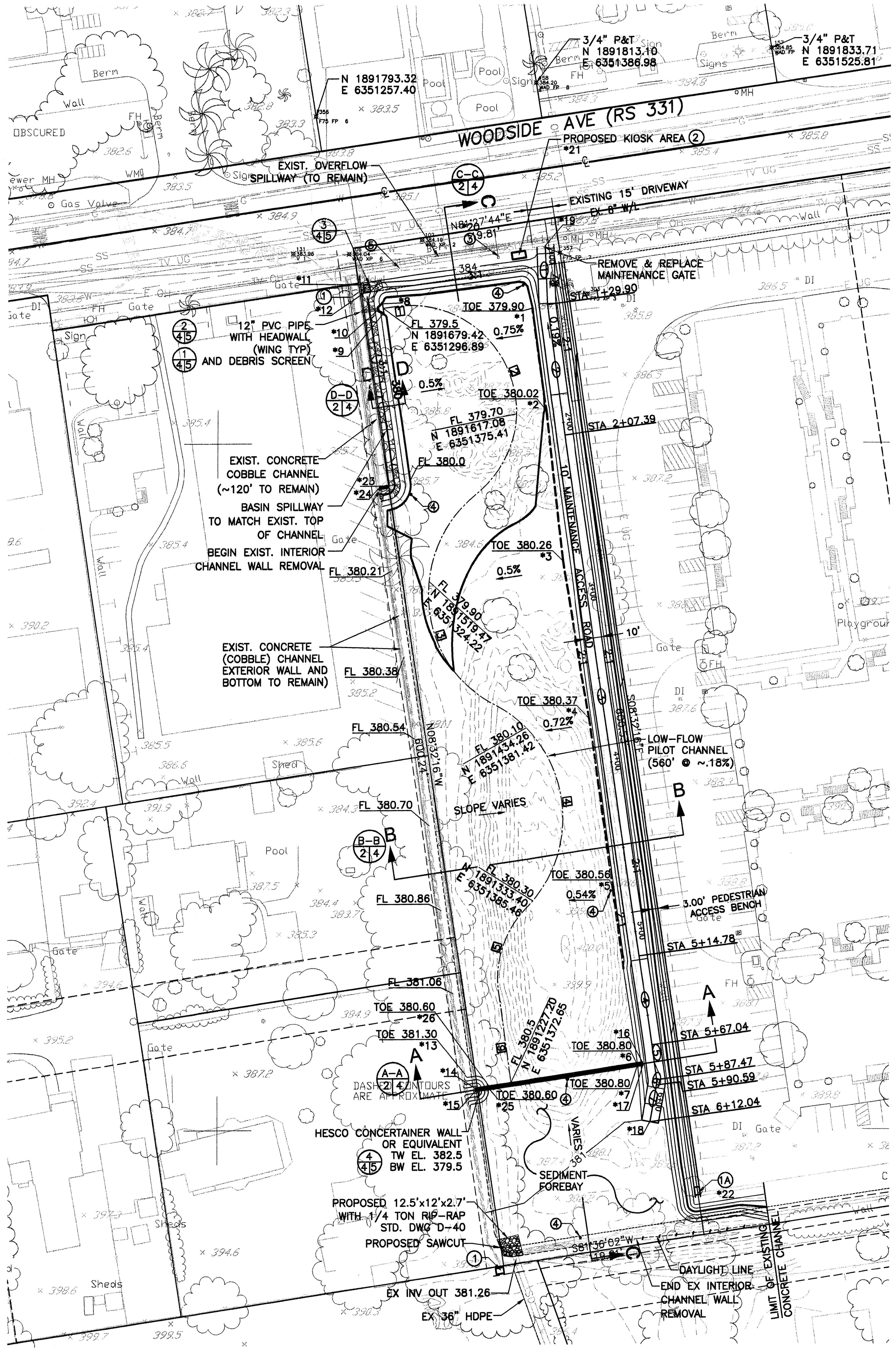
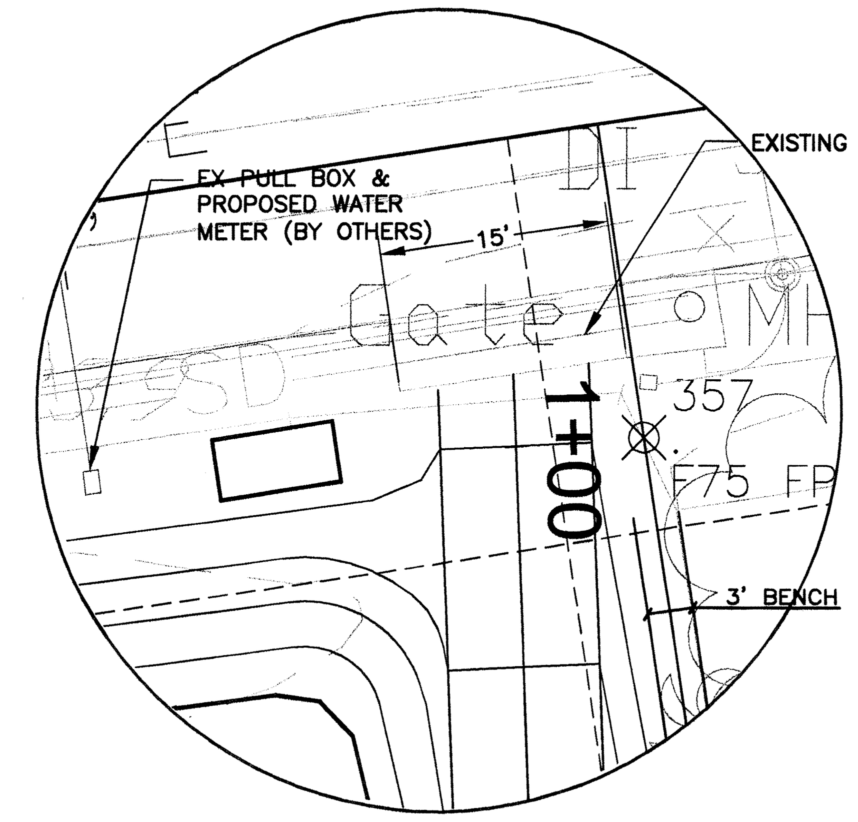
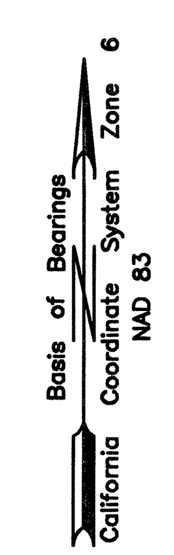
SAN DIEGO, CA. 92110
619-291-0707

REGISTERED CIVIL ENGINEER DATE





SCALE: HORZ 1" = 10'



CONSTRUCTION NOTE:

1. CONSTRUCT 3.5' x 4.5' CONCRETE PAD (4" THICK) FOR SAMPLING BOX.
1A. CONSTRUCT 3' x 4.5' CONCRETE PAD (4" THICK) FOR SAMPLING BOX.
2. CONTRACTOR TO PROVIDE AND INSTALL PREMANUFACTURED KIOSK BY BARCO PRODUCTS: MODEL KMCP3, SINGLE SIDED, DESERT TAN COLOR (OR EQUAL). DESIGNATED 4" SLAB AREA IS SHOWN AS 4' x 8'. LOCATE FACE OF SLAB ON FUTURE R/W

   ASSUME KIOSK WILL HAVE DUAL 4"x4" POSTS TO BE PLACED IN 12" DIA, 30" DEEP CONCRETE FOOTING
3. EXISTING 1" WATER SERVICE TO REMAIN AND 1" WATER METER TO BE INSTALLED BY OTHERS
4. CONTRACTOR TO INSTALL SEDIMENT DEPTH MARKERS, MARKERS PER DETAIL 5/4
5. CONTRACTOR TO REMOVE EX FENCE AND GATE AND REPLACE WITH NEW VINYL COATED CHAIN LINK FENCE AND GATE PER STD DWG M-5, M-6. NEW FENCE AND GATE TO BE PLACED ON FUTURE R/W

10' MAINTENANCE ACCESS ROAD CENTERLINE DATA

NO.	DELTA OR BRG	RADIUS	LENGTH	REMARKS
1	S02°10'04"E		34.63'	
2	S07°44'19"E		77.77'	
3	S08°20'13"E		307.39'	
4	S08°32'33"E		52.26'	
5	S07°34'05"E		27.42'	
6	Δ =17°51'23"	10.00'	3.12'	
7	S10°17'18"W		21.45'	

FLOWLINE DATA

NO.	DELTA OR BRG	RADIUS	LENGTH	REMARKS
1	S82°27'29"W		8.79'	
2	Δ=148°39'45"	62.33'	161.73'	
3	Δ=115°36'37"	73.00'	147.30'	
4	Δ=106°28'54"	74.58'	138.61'	
5	Δ =54°14'23"	59.64'	56.46'	
6	N07°51'49"W		49.47'	

NO.	NORTHING	EASTHING	REMARKS
*1	N 1891679.37	E 6351384.54	TOE
*2	N 1891619.46	E 6351392.96	TOE
*3	N 1891531.02	E 6351403.04	TOE
*4	N 1891439.80	E 6351418.79	TOE
*5	N 1891340.38	E 6351433.07	TOE
*6	N 1891238.31	E 6351447.21	TOE
*7	N 1891236.26	E 6351447.36	TOE
*8	N 1891682.05	E 6351296.51	WING WALL
*9	N 1891676.61	E 6351297.29	WING WALL
*10	N 1891678.96	E 6351294.29	12" PVC PIPE INVERT
*11	N 1891688.69	E 6351285.34	SAMPLING PAD
*12	N 1891688.69	E 6351285.94	SAMPLING PAD
*13	N 1891232.05	E 6351345.80	TOE
*14	N 1891223.91	E 6351351.46	NW CORNER OF HESCO WALL
*15	N 1891222.13	E 6351351.73	SW CORNER OF HESCO WALL
*16	N 1891238.81	E 6351450.58	NE CORNER OF HESCO WALL
*17	N 1891237.02	E 6351450.82	SE CORNER OF HESCO WALL
*18	N 1891204.40	E 6351455.09	END OF MAINTENANCE ACCESS ROAD
*19	N 1891716.07	E 6351392.23	BEGIN OF MAINTENANCE ACCESS ROAD
*20	N 1891709.04	E 6351364.44	EXISTING WATER SERVICE
*21	N 1891710.47	E 6351376.58	KIOSK
*22	N 1891164.12	E 6351482.87	SAMPLING PAD
*23	N 1891574.84	E 6351299.13	BEGIN EXISTING INTERIOR CHANNEL WALL REMOVAL
*24	N 1891574.26	E 6351295.22	BEGIN EXISTING INTERIOR CHANNEL WALL REMOVAL
*25	N 1891223.39	E 6351360.10	TOE
*26	N 1891225.17	E 6351359.84	TOE

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COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5555 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

RICK ENGINEERING COMPANY
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619.291.0707
(FAX)619.291.4165
rickengineering.com
San Diego Riverside Sacramento Orange Phoenix Tucson

REVISIONS	BY	APPROVED	DATE

COORDINATE INDEX
250 N. 1785 E.
CONST. COMPL.
FIELD REVISIONS

WOODSIDE AVENUE
WATER QUALITY BASIN
In the Vicinity of Lakeside
GRADING PLAN

SCALE: HOR. 1"=40' VERT. N/A
W.A. YF1531 R.S. 331
SHEET 4 OF 13

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

PLANS	BY	DATE
DESIGNED	BRENDAN HASTIE	
CHECKED	CARL HEWINGS	
DELINEATED	BRIAN LEDGERWOOD	

REGISTERED PROFESSIONAL ENGINEER — John D. Goddard — No. 33037 — Exp. 6/30/06 — CIVIL — STATE OF CALIFORNIA

RICK ENGINEERING
5620 FRIARS RD.
SAN DIEGO, CA. 92110
619-291-0707

REGISTERED CIVIL ENGINEER — DATE

NOTE:

ⓐ EXISTING 5' DRAINAGE DITCH EASEMENT TO COUNTY OF SAN DIEGO, BK. 831, P.191, O.R. REC. SEPT. 29, 1983

ⓑ EXISTING 15' DRAINAGE CHANNEL EASEMENT TO SAN DIEGO COUNTY FLOOD CONTROL DISTRICT F/P 86-494409, O.R. REC. OCT 30, 1986

ⓒ EXISTING 35' EASEMENT FOR CHANNEL MAINTENANCE TO WOODSIDE LTD. F/P 83-397266, O.P. REC. NOV. 2, 1983

ⓓ EXISTING 15' DRAINAGE EASEMENT TO COUNTY OF SAN DIEGO PER DOC NO 1997-0475014 OR REC, SEPT. 25, 1997

Basis of Bearings
California Coordinate System Zone 6
NAD 83

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COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5555 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

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REVISIONS	BY	APPROVED	DATE

COORDINATE INDEX
250 N. 1785 E.
CONST. COMPL.
FIELD REVISIONS

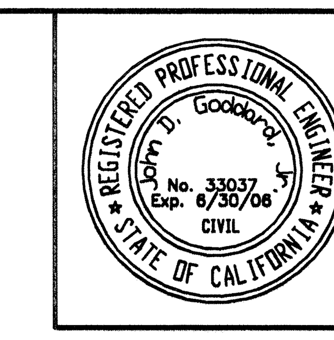
WOODSIDE AVENUE
WATER QUALITY BASIN
In the Vicinity of Lakeside
EXISTING CONDITIONS / CONSTRAINS

SCALE: HOR. 1"=40' VERT. N/A
W.A. YF1531 R.S. 331
SHEET 3 OF 13

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

-1 0 1 2 3 4 5 6 7 8 9 10

PLANS	BY	DATE
DESIGNED	BRENDAN HASTIE	
CHECKED	CARL HEWINGS	
DELINEATED	BRIAN LEDGERWOOD	



RICK ENGINEERING
5620 FRIARS RD.
SAN DIEGO, CA. 92110
619-291-0707

REGISTERED CIVIL ENGINEER DATE

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
&	AND
AB	AGGREGATE BASE
AC	ASPHALT CONCRETE
ACP	ASBESTOS CEMENT PIPE
BC	BEGINNING OF CURVE
BVC	BEGINNING OF VERTICAL CURVE
BW	BOTTOM OF WALL
C&G	CURB AND GUTTER
CFS	CUBIC FEET PER SECOND
CI	CAST IRON PIPE
CIP	CAST-IN-PLACE
℄	CENTERLINE
CL	CLASS
CO	CLEANOUT
CONC	CONCRETE
CONST	CONSTRUCT
CONST'N	CONSTRUCTION
CSP	CORRUGATED STEEL PIPE
CSPA	CORRUGATED STEEL PIPE ARCH
CTSP	CALTRANS STANDARD PLANS
DE	DEAD END
Δ	DELTA
DRAIN	DRAINAGE
DWY	DRIVEWAY
EC	END OF CURVE
EL	ELEVATION
EP	EDGE OF PAVEMENT
EVC	END OF VERTICAL CURVE
EX	EXISTING
EG	EXISTING GROUND
FG	FINISH GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
HH	HANDHOLE
HWY	HIGHWAY
IE	INVERT ELEVATION
L	ARC LENGTH
LF	LINEAR FOOT
LT	LEFT
MH	MANHOLE
MIN	MINIMUM
NAD	NORTH AMERICAN DATUM
OG	ORIGINAL GROUND
OHD	OVERHEAD
PCC	PORTLAND CEMENT CONCRETE
PCR	POINT OF CURB/CURVE RETURN
PED	PEDESTRIAN
PI	POINT OF INTERSECTION/ANGLE POINT
PL	PLACE
P	PROPERTY LINE
PROF	PROFILE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
Q	RATE OF FLOW
R	RADIUS
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RS	ROAD SURVEY
RSD	REGIONAL STANDARD DRAWING
RT	RIGHT
R/W	RIGHT-OF-WAY
SD	STORM DRAIN
SDCDS	SAN DIEGO COUNTY DESIGN STANDARD
S/W	SIDEWALK
S	SLOPE
ST	STREET
STA	STATION
SWR	SANITARY SEWER
T	TANGENT LENGTH
TC	TOP OF CURB
TELE	TELEPHONE
TW	TOP OF WALL
USC&GS	UNITED STATES COASTAL & GEODETIC SURVEY
VC	VERTICAL CURVE LENGTH
VCP	VITRIFIED CLAY PIPE
WTR	WATER

HORIZONTAL CONTROL

ALL BEARINGS, DISTANCES, STATIONS AND COORDINATES ARE GRID AND BASED ON THE NORTH AMERICAN DATUM OF 1983(1991.35) CALIFORNIA COORDINATE SYSTEM, ZONE 6. AS DEFINED BY SECTIONS 8801 THROUGH 8819 OF THE CALIFORNIA PUBLIC RESOURCES CODE. CONTROL IS BASED ON FIRST ORDER CONTROL STATIONS 'FIT-2' & 'GF 25-92' PER ROS 16652.

AT STATION: "WAD XP 2"

NORTHING = 1891719.677
EASTING = 6351319.690
EL = 384.19
λ = 0°22'35.01"

THE COMBINATION FACTOR = 0.99997574

GROUND DISTANCE = $\dfrac{\text{GRID DISTANCE}}{\text{COMBINATION FACTOR}}$

BENCHMARKS

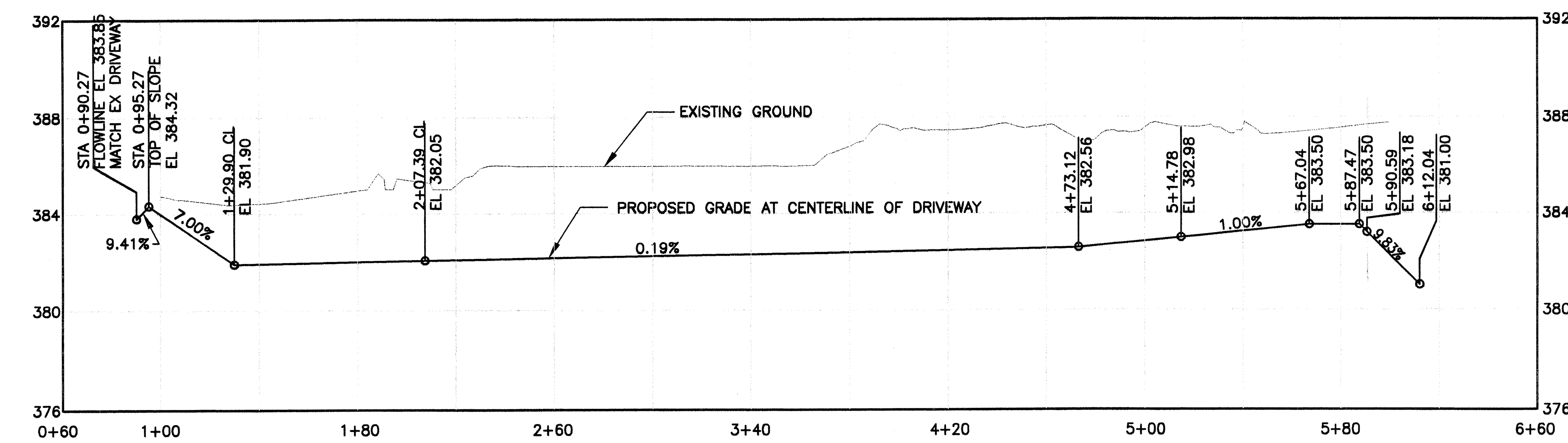
DESIGNATION: 0169

DESCRIPTION: BRASS DISK SET IN CONCRETE BELOW SURFACE

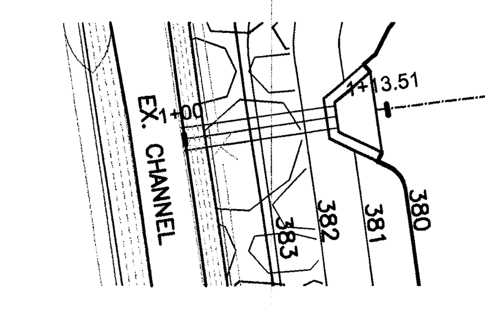
LOCATION: C/L MON ON WINTERGARDENS BLVD APPROX. 2674 FT. N'LY OF INT. OF GAY RIO DRIVE

ELEVATION: 462.558'

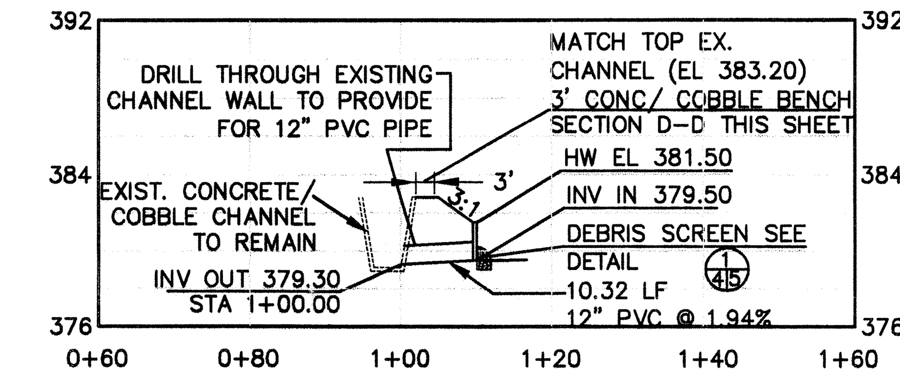
DATUM: VERTICAL DATUM IS NGVD 1929.



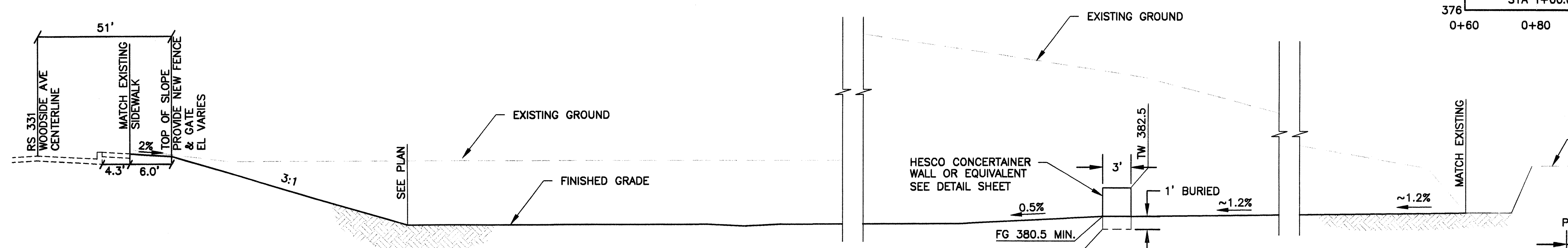
10' MAINTENANCE ACCESS ROAD PROFILE
SCALE HORZ 1" =40'
VERT 1" =4'



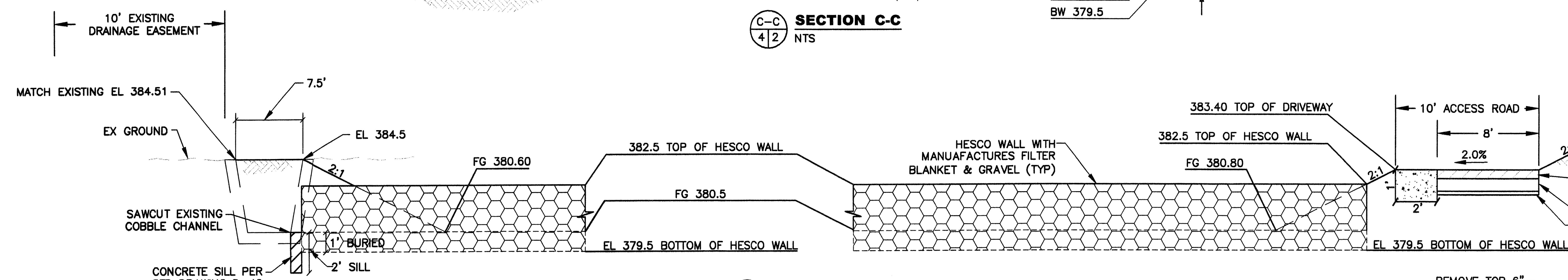
PLAN VIEW
SCALE: HORZ 1" =10'



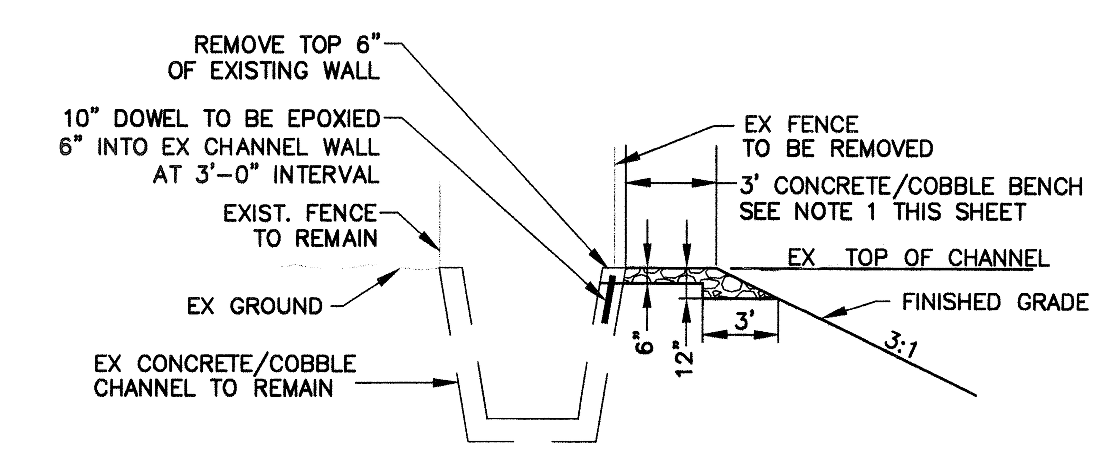
OUTLET PROFILE
SCALE HORZ 1" =20'
VERT 1" =8'



SECTION C-C (C-C 4 2)
NTS



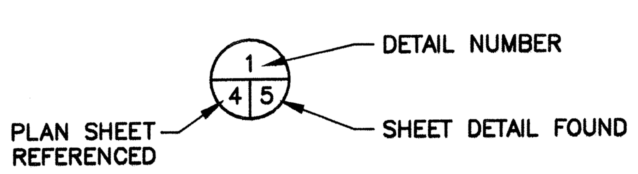
SECTION A-A (A-A 4 2)
NTS

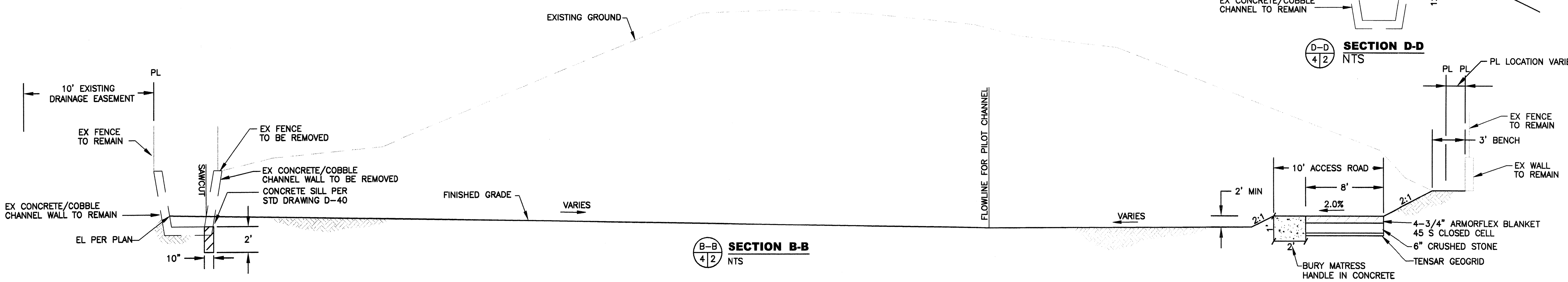


SECTION D-D (D-D 4 2)
NTS

NOTES:

1. USE PORTION OF EXISTING CHANNEL REMOVAL.





SECTION B-B (B-B 4 2)
NTS

Basis of Bearings
California Coordinate System Zone 6
NAD 83

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250 N. 1785 E.
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WOODSIDE AVENUE
WATER QUALITY BASIN
In the Vicinity of Lakeside
TYPICAL SECTIONS / ABBREVIATIONS

SCALE: HOR. N/A VERT. N/A
W.A. YF1531 R.S. 331
SHEET 2 OF 13